



Natural Resources Commission

Final report

Review of the Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009

May 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 Hunter, the Commission pays its respects to the Wanaruah, Worimi, Awabakal, Biripi, Kamilaroi, Darkinjung and Geawegal 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 and Local Aboriginal Land Councils throughout the review process will help to shape collaborative water planning and sharing that is beneficial to Aboriginal peoples and their country.

Enquiries

Enquiries about this report should be directed to:

Name	Alex Benecke
Phone	(02) 9228 4844
Fax	(02) 9228 4970
E-Mail	nrc@nrc.nsw.gov.au
Postal address	GPO Box 5341, Sydney NSW 2001

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Acronyms and units of measurement

Act	The <i>Water Management Act 2000</i> (NSW)
AHIMS	Aboriginal Heritage Information Management System
AWD	Available water determination
Commission	The Natural Resources Commission
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DoI-Water	Former NSW Department of Industry – Water
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	NSW Environment Protection Authority
GIS	Geographic Information System
Hunter Water	Hunter Water Corporation
IT	Information Technology
LGA	Local government area
LTAAEL	Long term annual average extraction limit
MDBA	Murray Darling Basin Authority
MER	Monitoring, evaluation and reporting
ML	Megalitre (unit of volume equivalent to one million (1×10 ⁶) litres)
NARClM	The NSW and ACT Regional Climate Modelling project
NSW	New South Wales
OEH	Former NSW Office of Environment and Heritage
Plan	The <i>Water Sharing Plan for the Hunter Unregulated, Alluvium and Fractured Rock Water Sources 2009</i> (NSW)
SMART	Specific, measurable, achievable, relevant and time-bound

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Executive summary

The Natural Resources Commission (the Commission) has reviewed the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009* (the Plan), as required under Section 43A of the *Water Management Act 2000* (the Act).¹ Water sharing plans set the rules for how water is allocated to protect the environmental health of water sources and ensure water sources are sustainable in the long term.

The Commission has assessed the extent to which the provisions of the Plan have contributed to achieving environmental, social, cultural and economic outcomes, and advised where changes to the Plan provisions are warranted.

Overall advice on Plan extension and replacement

Following a comprehensive analysis of available evidence and public consultation, the Commission has identified a range of issues that justify replacing the Plan. Addressing these issues will improve the health of the water sources, provide greater water security for communities and industry and enable best practice water management.

In particular, the Plan does not set clear numeric extraction limits or adequately account for all water take. It also gives the potential to increase water take through increased entitlements and exemptions. This increases the risk to the environmental assets across the Plan area. This will also decrease reliability to existing water users covered by both the regulated and unregulated water sharing plans, resulting in a significant economic impact.

The Plan was developed as a transitional plan with the intent to undertake further studies to support the design and implementation of provisions. However, studies for important provisions, such as some cease to pump rules that control when water can be taken, have largely not occurred due to resourcing constraints. Key provisions, such as cease to pump rules, are not being adequately implemented to achieve environmental, social and economic outcomes, which has created the potential for inequity and misunderstanding between water users. Further, the Plan has not adequately considered Aboriginal water values in the area or supported cultural water access and use.

Water managed under the Plan provides flows to important environmental assets, including the Ramsar-listed Hunter Estuary Wetlands. It also provides water for a diverse range of regional- and state-significant industries, which contribute around 28 percent of regional NSW's total economic output. Given these significant values, the issues identified in this review should be addressed and a replacement Plan developed that protects the values associated with these important assets.

Establishing limits to the availability of water is particularly important for this Plan, as water entitlements across the Hunter Valley have reached their full allocations. Significant risks to water security under existing entitlement levels were identified by the *Greater Hunter Regional Water Strategy*. Provisions that allow for increased entitlements may exacerbate these existing environmental, economic and social risks. Drought security was identified as the primary

¹ Parliament of NSW (2009) *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*. Available at: <https://legislation.nsw.gov.au/#/view/regulation/2009/347/full>.

economic risk facing the Hunter Valley, which was reinforced by the severe drought experienced in the region since 2017.

The replacement Plan should be developed following a more coordinated approach with the seven other water sharing plans in the Greater Hunter region to manage the significant connectivity between these plans, particularly the *Water Sharing Plan for the Regulated Hunter River Water Source*. It should also align with urban water planning such as the *Greater Hunter Regional Water Strategy*, which includes significant infrastructure options and other actions that will have implications for water sharing plans, and the *Lower Hunter Water Plan*.

The Commission recommends that the Plan is:

- 1 **extended for a further two years until 30 June 2022**, with priority actions and amendments progressed in the interim, including to provisions for long term average annual extraction limits (LTAAELs), available water determinations (AWDs), cease to pump and environmental flow rules, and high flow licence conversions. Extending the Plan will provide enough time to undertake necessary foundational studies and allow better alignment with infrastructure investment under the *Greater Hunter Regional Water Strategy*.
- 2 **replaced by 1 July 2022** supported by the completion of planned or underway foundational studies, monitoring and assessments, as well as new actions recommended in this review. The replacement process should ensure the Plan is aligned with other Greater Hunter plans to ensure consistency of objectives and integration of provisions that should be managed across plans.

An overview of the review findings and recommendations is provided in **Table 1**. The Commission acknowledges that the Department of Planning, Industry and Environment – Water (DPIE-Water) is already progressing work to support recommendations in key areas, including estimating take from harvestable rights, reviewing cease to pump rules, addressing risks to town water supply and the development of a monitoring, evaluation and reporting (MER) framework for coastal water sharing plans.

Findings and recommendations

Table 1: Overview of findings, recommendations and suggested actions for DPIE-Water (unless otherwise stated)

(* denotes initiatives that should be undertaken across NSW to support outcomes in all water sharing plans)

Overall advice on Plan extension and replacement	
Recommendation 1	<p>The Plan should be:</p> <ol style="list-style-type: none"> a) extended for a further two years until 30 June 2022, with priority actions and amendments progressed in the interim, including to provisions for LTAAELs, AWDs, cease to pump and environmental flow rules, and high flow licence conversions b) replaced by 1 July 2022 supported by the completion of planned or underway foundational studies, monitoring and assessments, as well as new actions recommended in this review. The replacement process should ensure the Plan is aligned with other Greater Hunter plans to ensure consistency of objectives and integration of provisions that should be managed across plans.
Provisions related to how much water can be extracted	
Finding	<p>The Plan established LTAAELs for the unregulated rivers and alluvial water sources, but these do not:</p> <ul style="list-style-type: none"> ▪ provide a numeric (volumetric) extraction limit, except for Hunter Water Corporation (Hunter Water), making it difficult to assess actual extraction against extraction limits and adjust future water usage accordingly ▪ consider all water take, including significant volumes extracted under harvestable rights, exempted take under pollution control licences, and diversions at Seaham Weir.
Finding	<p>The Hunter Valley has already reached its full level of water entitlements and Plan provisions that allow for increased entitlements may exacerbate existing environmental, economic and social risks.</p>
Recommendation 2	<p>To adequately establish and maintain a sustainable limit on the level of water extraction, amend the Plan by the start of the 2021-22 water year to:</p> <ol style="list-style-type: none"> a) establish and publish numeric values for LTAAELs that are updated annually and consider all forms of take, including: <ol style="list-style-type: none"> i) estimates of current and potential take from harvestable rights ii) capture of rainfall runoff that is exempt from harvestable rights under Environment Protection Licences iii) actual volumes removed from the Williams River by Hunter Water b) remove the high flow conversion clause (Clause 72(d)) that increase the LTAAELs by creating additional entitlements c) reduce the entitlement for Hunter Water to align with its revised LTAAEL and allow Hunter Water's compliance with its LTAAEL to be assessed using a rolling average to account for yearly variations in flow in the Williams River.

Provisions related to when water can be extracted	
Finding	<p>The Plan has provisions for AWDs, but these are:</p> <ul style="list-style-type: none"> ▪ not functioning as designed largely due to incomplete LTAAELs ▪ not aligned with AWDs in other water sharing plans in the Greater Hunter region, creating the potential for unintended inequity in water access between licensed users, particularly during drought ▪ not being used to proactively manage extraction during drought.
Recommendation 3	<p>By the start of the 2021-22 water year, amend the Plan to remove Clause 54(4)(b) to ensure AWDs for the Hunter Regulated River Alluvial Water Source are aligned with those for the <i>Water Sharing Plan for the Regulated Hunter River Water Source 2016</i>.</p>
Recommendation 4	<p>Following stakeholder consultation, the replacement Plan (or, if agreed beforehand, an amendment to the Plan) should:</p> <ol style="list-style-type: none"> a) consistently and transparently calculate AWDs each year to ensure compliance with LTAAELs b) align AWDs for users in the unregulated Hunter River, Paterson River and Wallis Creek tidal pool water sources with AWDs for upstream Hunter Regulated Plan users c) include rules following DPIE-Water’s consideration of how AWDs can be used to manage extraction during drought, including under predicted climate change.
Finding	<p>Adequate environmental flow rules have not been implemented across all water sources in the Plan area. Studies have not been undertaken to inform environmental flow rules in high instream (ecological) value water sources and two of these water sources have no rules. ‘No visible flow’ cease to pump rules that are in place in some of these sources may also not be adequate to protect environmental values.</p>
Finding	<p>Water sources not classified as having high ecological value have either no rules or lower protection cease to pump rules. While lower protection rules may be appropriate in areas of lower ecological risk, rules are required for all water sources under the Act. Further, the proportion of water sources with no or limited rules is relatively high and therefore unlikely to adequately protect flows across the Hunter Valley.</p>
Finding	<p>The current variation in cease to pump rules across the Plan area has created stakeholder confusion and perceptions of inequity in water share. While rules should vary based on risk in each water source, current variations are not clearly based on risk or clearly communicated.</p>
Finding	<p>The Plan currently allows for cease to pump rules for connected surface and groundwater sources to come into effect at the same time, which is good practice. However, there may be time delays in the response of groundwater sources to dry conditions, which could be reflected in cease to pump rules to support socioeconomic outcomes in times of drought.</p>
Recommendation 5	<p>By the start of the 2021-22 water year, amend the Plan to include interim environmental flow rules for the high ecological value Upper Goulburn and Wollombi water sources (which do not currently have rules) and require environmental flow rules to be established for all water sources in the Plan replacement. For the replacement Plan in 2022, reassess environmental flow</p>

	<p>rules for all water sources and amend rules if needed. The assessment should:</p> <ul style="list-style-type: none"> a) be evidence-based b) examine whether current rules can be more effective and efficient c) ensure rules are developed for each water source to reflect the specific risks to each water source, with the rationale behind these risks clearly communicated to stakeholders d) review the adequacy of rules for maintaining water quality, fish passage and productive aquatic ecosystems e) review the adequacy of rules for high ecological value water sources to meet the reproductive requirements of water dependent threatened species by including, for example, first flush rules to ensure water reaches the end of the water source and seasonal rules to increase cease to pump levels at critical ecological periods f) consider connectivity between alluvial and surface water licences and, if high connectivity is identified, ensure cease to pump rules are consistent g) consider time delays to the best extent possible in groundwater-river response in connected systems h) consider the range of social and economic impacts from changes to rules and mitigate adverse impacts to the extent possible.
Finding	<p>Environmental flow rules for Hunter Water, which seek to ensure adequate water is available for the Hunter Estuary, have been developed but have not been implemented. The Commission understands this is because modifications to Seaham Weir required to fully implement the rules are still underway. However, the Commission considers interim rules could be used to achieve some benefit prior to completion of the modification works.</p>
Recommendation 6	<p>By the start of the 2021-22 water year, amend the Plan to include the NSW Government-endorsed environmental flow rules for Hunter Water and implement these rules to the best extent possible with the current configuration of Seaham Weir, fully implementing rules once Seaham Weir is modified.</p>
Finding	<p>The Plan provides for salinity monitoring of the Hunter estuary and the development of environmental flow rules for the four tidal pool water sources. Salinity monitoring has generated good data and an estuary model has been developed, but the flow rules have not yet been established due to limited resources.</p>
Recommendation 7	<p>Establish tidal pool access rules for the replacement Plan based on the Hunter hydrodynamic estuary models developed by the Hunter Valley Hydrodynamic Platform and Model(s) Project.</p>
Finding	<p>Some State significant developments, for example certain mining operations and other Ministerially approved developments, are exempt from cease to pump rules for aquifer interference activities. While the exemption may be necessary from an operational perspective, the process to mitigate take under this exemption is ambiguous and it is unclear if mitigation has reduced risks to the environment and other users. Given the volume of water exempted has been estimated by the CSIRO to be significant, the Commission considers that the effectiveness of the mitigation process should be examined.</p>
Recommendation 8	<p>By the start of the 2021-22 water year:</p>

	<ul style="list-style-type: none"> a) the Natural Resource Access Regulator should consider undertaking an audit of approvals to date under Clause 19(8) parts b and c to determine if the clause has been given effect to b) DPIE-Water should amend Clause 19(8) parts b and c on planned environmental water, which allow for cease to pump exemptions for aquifer interference activities that are either approved by the <i>Environment, Planning and Assessment Act 1979</i> or the Minister, to require 100 percent mitigation of any exemptions c) DPIE-Water should account for mitigation annually and daily (the timescale at which cease to pump rules operate).
Provisions related to who can extract water	
Finding	The Plan provides for basic landholder rights. Currently there is no monitoring of take for basic landholder rights and there is misunderstanding among water users of the nature of these rights and how to use them.
Recommendation 9*	Continue processes to develop the reasonable use guidelines for stock and domestic use by the end of 2020 and include the agreed standards as part of the replacement Plan.
Recommendation 10	Include a performance indicator for harvestable rights in the MER framework (see Recommendation 24).
Finding	The basic landholder rights for native title are not adequately supported with amendment provisions to ensure they are implemented following native title determinations and other land/water use agreements.
Recommendation 11*	Include a provision to amend native title rights, with 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 water allocation process.
Finding	The Plan acknowledges Aboriginal water values and accommodates state-wide licence mechanisms for Aboriginal water use. However, there has been no specific work to identify Aboriginal water-related values in the Plan area, limited engagement with Aboriginal peoples and Aboriginal people have not been able to access and use water under existing mechanisms.
Recommendation 12*	Identify Aboriginal values and uses, objectives and outcomes, and flow allocations in the Plan area, using a strengthened NSW Aboriginal Water Framework (see Suggested action A).
Recommendation 13*	Co-design licences or other water access options with Aboriginal stakeholders that meet identified needs (for a range of cultural, environmental, social and economic uses) and include these in the Plan, using a strengthened NSW Aboriginal Water Framework.
Suggested action A*	Continue development of the NSW Aboriginal Water Framework by the end of 2020 to provide consistent and transparent guidelines and resourcing for Aboriginal involvement in water planning and management in NSW. At a minimum, the framework should align with relevant international and national guidelines, key legislation, and consider a range of minimum criteria (see Section 6.2.2).

Finding	There are several immediate and future risks to town water supply that need to be better managed as part of the Plan, including increasing population and changes in water demand, climate change and drought.
Recommendation 14	Ensure the replacement Plan aligns with identified risks to town water supply in key research, plans and projections (<i>Greater Hunter Regional Strategy 2018, Lower Hunter Water Plan</i> and the Hunter Water Operating Licence). Include identified town water risks as part of MER requirements of the Plan (see Recommendation 24).
Recommendation 15*	Better define and communicate equitable water sharing and include a performance indicator for equitable water sharing in the MER framework for the Plan so that it can be monitored and assessed (see Recommendation 24).
Provisions related to where water can be extracted from	
Finding	The Plan classifies each water source according to its instream (ecological) and economic dependence to determine the appropriate rules for each water source. Some water sources with high ecological values may not be recognised. For example, some water sources with a relatively high number of threatened species have not been listed as high ecological value water sources. Further, mapping of threatened species has improved over the life of the Plan, which should be reflected in classifications. There have also been significant changes in the Hunter Valley's industry profile over the life of the Plan compared with industries considered in the assessment of economic dependence.
Recommendation 16	For the replacement Plan, review all water sources and determine which water sources should be classified as having high ecological value, using all available data and the latest classification methods.
Recommendation 17	Reassess the economic dependence of each water source in the Plan area to inform the development of the replacement Plan. The assessment should assess the full range of current and future industries and activities that will require access to secure water, including: <ul style="list-style-type: none"> a) extractive industries (for example, dairy, beef, mining) b) non-extractive industries (for example, tourism, aquaculture) c) ecosystem services (for example, recreation, amenity).
Finding	The Plan has access licence dealing rules that provide for trade under specified conditions, although some stakeholders would like increased flexibility for trading between water sources, licence types and water sharing plan areas.
Recommendation 18	For the replacement Plan in 2022, review current trading rules and the Minister's <i>Access Dealing Principles Order</i> to determine if they can be revised to support more trade. This review should consider: <ul style="list-style-type: none"> a) environmental impacts of any potential changes and ensure environmental outcomes can be maintained b) whether new options such as trading from low to high flow licences may allow for greater levels of trade without compromising environmental values.
Finding	Stakeholders indicated that rules in the Plan do not align with report cards and licence conditions for trading between water sources. This creates

	confusion for market participants and uncertainty for management of the water sources.
Recommendation 19	By end of 2020, review and amend any drafting errors in the Plan around trade and ensure report cards and licence conditions are consistent and clearly communicated to licence holders.
Finding	There are inconsistencies in licence conversion rules between surface water and groundwater, including differences in stated rules between the Plan and report cards for various water sources. There are inconsistencies between licence conversion rules for groundwater to surface water in highly connected water sources.
Recommendation 20	For the replacement Plan in 2022, review the Plan, report cards and other supporting documents and update as required to ensure consistency in stated conversion requirements for surface water to groundwater licences. Once clarified, conversion requirements should be clearly communicated to licence holders.
Recommendation 21	For the replacement Plan in 2022, assess the appropriateness of restrictions on groundwater to surface water licence conversions in highly connected upriver alluvial water sources. This should involve consideration of the potential to allow conversions from alluvial to unregulated river access licences to increase the flexibility of water access for users. This assessment should also consider the cease to pump rules for these management zones or water sources. If they are connected for licence conversions and trading, they should also be connected for access rules.
Finding	The Plan includes provisions to protect groundwater dependent ecosystems but does not clearly list specific ecosystems for protection or define their groundwater and surface flow requirements.
Recommendation 22	In the replacement Plan by 2022, improve the protection of groundwater dependent ecosystems by: <ul style="list-style-type: none"> a) listing all identified groundwater dependent ecosystems in Schedule 4 of the Plan, as well as in associated maps and documents b) identifying high, medium and low priority groundwater dependent ecosystems in the Plan and referring to them explicitly as relevant in any groundwater dependent ecosystem protection provisions c) clearly defining groundwater terms and their relevance to the Plan, including connectivity, ecological value, potential and type d) standardising set back distances for work near identified groundwater dependent ecosystems based on the <i>NSW Aquifer Interference Policy 2012</i>.
Requirements for monitoring, evaluation and reporting	
Finding	Significant gaps were identified in the evidence base of the Plan when it was developed, as well as actions to address these gaps. Progress on these actions has been limited. However, external studies have improved understanding of the interaction of surface and groundwater, end of system flow requirements, and climate change and variability. These studies should be incorporated into the Plan.
Recommendation 23	The replacement Plan by 2022 should be informed by the completion of relevant studies identified at Plan commencement and existing studies and should identify further studies required to improve the knowledge base.

Suggested action B*	By the end of 2020, identify state-wide research needs and knowledge gaps across all water sharing plans and address these gaps in collaboration with other organisations and research institutions.
Finding	The Plan's MER framework is inadequate. The Plan does not clearly specify or prioritise outcomes in line with the Act, or provide linkages between objectives, outcomes, strategies and performance indicators. Performance indicators are high-level and impractical to evaluate against. There is no overarching program, procedures or responsibilities to guide MER activities over the life of the Plan.
Finding	Salinity is a significant environmental issue in the Hunter Valley, particularly in groundwater systems. Stakeholders raised concerns regarding the lack of monitoring of groundwater extraction. While the Plan has a water quality indicator, groundwater quality is not supported by clear objectives and management strategies.
Recommendation 24*	<p>A Plan-specific MER framework should be developed for the replacement Plan that reflects state-wide guidelines (see Suggested action C). The framework should:</p> <ul style="list-style-type: none"> a) ensure objectives and performance indicators are included for all key outcomes of the Plan not currently accounted for, such as harvestable rights (see Recommendation 10), equitable water sharing (see Recommendation 15), urban water supply and salinity b) clearly define outcomes linked to specific, measurable, achievable, relevant and time-bound (SMART) objectives, strategies and performance indicators that align with the water management principles and priorities as set out in the Act c) set clear governance arrangements that define roles, responsibilities and timing for MER activities and adaptive management (including for metering) d) be supported by feasible and appropriate resourcing to support MER e) set timely reporting requirements of the results of MER activities to support transparency, public awareness and compliance, and adaptive management – this should include both government requirements (for example, annual reports to the Minister responsible for the Plan against Plan objectives and outcomes) and public reporting requirements (for example, an online water reporting platform and dashboard) f) include clear processes and governance for adaptive management g) incorporate relevant MER data that has been completed or is underway outside of the Plan.
Suggested action C*	Continue to develop state-wide MER, including a MER strategy for water planning and management in NSW by end of 2020 which considers key gaps at the state scale (for example, MER standards, reporting requirements, adaptive management principles and processes, resourcing and support).
Finding	Hunter Water and other larger users are currently metered, which means that the Plan area has a high proportion of extraction that is metered. The NSW Government's new metering framework (to be rolled out in 2023 in the Hunter Valley) should further capture a significant proportion of currently unmetered users, but the residual risks associated with remaining unmetered users to implementing Plan provisions should be assessed.

Recommendation 25	As part of the Plan replacement in 2022, assess the residual risk to implementing Plan provisions (including LTAAELs and AWDs) from users that are not captured under the NSW Government's metering framework.
Finding	The Plan's principles of adaptive management have not been adequately applied. While amendments have been made to the Plan, these have not addressed key knowledge gaps or changes to the operating environment of the Plan.
Recommendation 26	As part of the Plan replacement, include principles, governance arrangements, responsibilities and timeframes to ensure the effective implementation of the Plan, including its adaptive management.
Requirements for replacement Plan development and implementation	
Finding	Due to the complexity of the Plan and the lack of extension services to stakeholders there is a broad lack of stakeholder understanding of the Plan, the extent to which provisions and planned actions have been implemented, and the governance of water in NSW. There is a lack of clear governance for the Plan resulting in several instances in which the Plan and supporting actions were not implemented.
Suggested action D*	Adopt state-wide processes that support the Plan remake and implementation by: <ul style="list-style-type: none"> a) enhancing communication of water sharing plans through active, simple, and consistent language and modes of communication b) improving implementation and enforcement using clear and consistent governance, roles and responsibilities, and timelines.
Finding	Stakeholders described feeling disengaged from water planning, and that coastal areas were not adequately included as part of existing stakeholder engagement practices. While current resourcing makes it difficult to tailor stakeholder engagement in unregulated plans that have many different water sources, the benefits of active engagement should not be underestimated.
Suggested action E*	As part of the Plan replacement, develop well-evidenced and resourced processes for stakeholder engagement in the Plan area, including appropriate forums for engagement, such as stakeholder advisory panels that include a range of stakeholders with diverse interests and localised knowledge of water. This should be part of a strengthened state-wide stakeholder engagement strategy.
Finding	There are many opportunities to improve the evidence base and outcomes of the Plan by taking a wider, integrated catchment management approach in the development and implementation of the replacement Plan.
Suggested action F*	Before the Plan replacement in 2022, adopt integrated catchment management approaches that support the replacement and implementation.

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 2020.²

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 on:

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

Based on this review, the Commission can recommend whether a water sharing plan should be extended or replaced with a new plan.

In 2016, the Plan was amended to incorporate the water source previously managed under the *Water Sharing Plan for the Wybong Creek Source 2003*. This review focusses on the current provisions and does not consider previous versions of provisions governing water sharing under the Wybong Creek 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 (EES) within DPIE.

² Clause 3 of the Plan.
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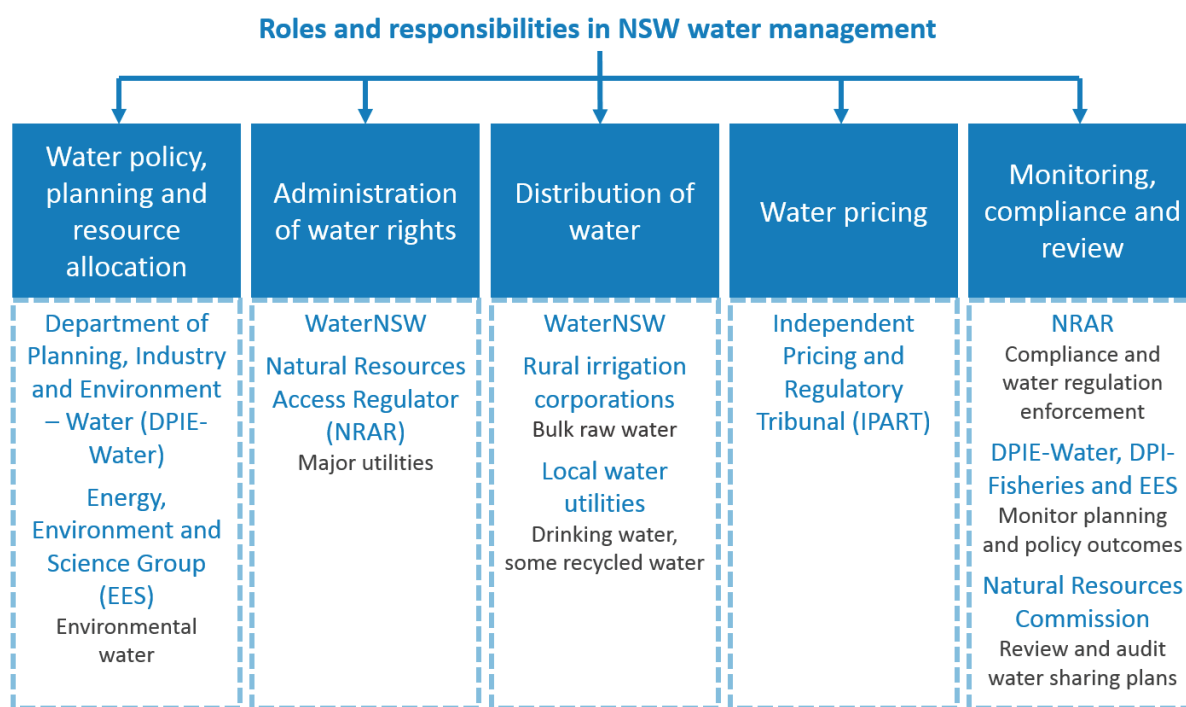


Figure 1: Roles and responsibilities in rural and regional water management³

1.1.1 Water management principles

The Commission is required to consider the water management principles listed in the Act in its review. Section 9(1)(b) of the Act makes it clear that water sharing is not about balancing uses and values, but about first providing for the environment and second recognising 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.⁴ 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).

1.2 Review approach

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

- **Targeted consultation** – 23 stakeholders were consulted, including a range of government agencies, community and industry organisations, Aboriginal stakeholders including Local Aboriginal Land Councils, and non-government organisations.⁵

³ 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.

⁴ *Water Management Act 2000*, Section 5.

⁵ Targeted consultation involved interviews with key stakeholders identified as part of the review. A total of 25 key stakeholder groups were contacted of which 23 individuals were interviewed as part of 17 interviews. Interviews were undertaken by telephone or face-to-face and documented in comprehensive notes but not recorded and transcribed, hence some quotes are reported as ‘indirect’ rather than “direct” quotes.

- **Document review** – the Commission reviewed the Plan and its background document. It also obtained publicly available information and unpublished reports from water management agencies, including DPIE-Water. As required, the Commission considered other relevant state-wide and regional government policies or agreements that apply to the catchment management area.
- **Technical advice** – consultants provided expert analysis on Plan provisions and opportunities for improvement.
- **Submissions** – when reviewing water sharing plans, the Commission must call for and consider public submissions. The Commission received 48 written submissions for this review. The Commission called for submissions via letters and emails to key stakeholders, advertised in *The Land* newspaper and on the Commission’s website.

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 will be made public on the Commission’s website.

The Commission would like to thank all the stakeholders who contributed to this review for their time and valuable input.

1.2.1 Evaluation of Plan performance

In conducting this review, the Commission considered the Plan’s performance against its stated objectives and performance indicators, which were linked to each of the broader outcome categories required under the review (environmental, social, cultural and economic outcomes). The Plan objectives, indicators and their relevant outcome category are shown in **Table 2**.

Only limited monitoring has been undertaken to measure the outcomes achieved against each stated objective, making it difficult to determine plan performance. To allow for future evaluation, a robust MER framework should be developed (see **Chapter 8**).

Because of the limited monitoring and Plan-specific evidence, the Commission relied on several other studies to assess the Plan, including:

- the Australian Government’s Bioregional Assessment for the Hunter subregion, which identified environmental assets and improved understanding of the interaction of surface and groundwater across the region
- reports from the Hunter Valley Hydrodynamic Platform and Model(s) Project, which developed a whole-of-government (NSW Government and local government) hydrodynamic model of the Hunter estuary⁶
- results on climate change and variability from the *Greater Hunter Regional Water Strategy*.

⁶ University of NSW (n.d.) *Water Research Laboratory – Hunter Scoping Study*. Available at: <http://www.wrl.unsw.edu.au/sites/wrl/files/uploads/PDF/Hunter-Scoping-Study.pdf>.

Table 2: Objectives and indicators used for the Commission’s evaluation

Stated Plan objective	Stated Plan performance indicator	Strategies	Primary outcome category
10(a) protect, preserve, maintain or enhance the important river flow dependent and high priority groundwater dependent ecosystems of these water sources	12(a) change in low flow regime 12(b) the 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	11(b) establish environmental water rules 11(f) establish rules that place limits on the availability of water for extraction 11(g) establish rules for making available water determinations 11(i) establish rules which specify the circumstances under which water may be taken	Environmental
10(b) protect, preserve, maintain and enhance the Aboriginal, cultural and heritage values of these water sources	12(h) 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 12(f) the change in the extent to which domestic and stock rights and native title rights requirements have been met	11(f) establish rules that place limits on the availability of water for extraction 11(g) establish rules for making available water determinations 11(i) establish rules which specify the circumstances under which water may be taken	Social (cultural)
10(c) protect basic landholder rights	12(f) change in the extent to which domestic and stock rights and native title rights requirements have been met	11(c) identify water requirements for basic landholder rights 11(f) establish rules that place limits on the availability of water for extraction 11(g) establish rules for making available water determinations 11(i) establish rules which specify the circumstances under which water may be taken	Social
10(d) manage these water sources to ensure equitable sharing between users ⁷	12(f) change in the extent to which domestic and stock rights and native title rights requirements have been met 12(h) the change in the extent to which water has been	11(d) identify water requirements for access licences 11(g) establish rules for making available water determinations	Social

⁷ 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).

Stated Plan objective	Stated Plan performance indicator	Strategies	Primary outcome category
	made available in recognition of the Aboriginal, cultural and heritage values of these water sources	11(i) establish rules which specify the circumstances under which water may be taken	
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	11(j) establish access licence dealing rules 11(f) establish rules that place limits on the availability of water for extraction	Economic
10(f) provide recognition of the connectivity between surface water and groundwater	12(c) change in surface water and groundwater extraction relative to the long-term average annual extraction limit 12(d) the change in water quality in these water sources 12(e) the change in the ecological condition of these water sources and their dependent ecosystems	11(i) establish rules which specify the circumstances under which water may be taken 11(f) establish rules that place limits on the availability of water for extraction 11(g) establish rules for making available water determinations	Environmental
10(g) provide sufficient flexibility in water account management to encourage responsible use of available water	12(g) change in economic benefits derived from water extraction and use	11(h) establish rules for the operation of water accounts 11(e) establish rules for granting and amending of access licences and approvals	Economic
10(h) adaptively manage these water sources	All	11(a) establish performance indicators 11(k) identify triggers for and limit to changes to the rules	All

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 40 water sources, including one alluvial groundwater source.⁸
- The Plan includes total licenced water entitlement of 557,861 share component units. Most of this entitlement (62 percent) belongs to major utility licences, the majority of which are held by Hunter Water. Unregulated river access licences (21 percent) and aquifer licences (16 percent) make up most of the remaining entitlement.
- The Hunter Valley includes important biodiversity assets, including significant areas of national parks and nature reserves, World Heritage listed areas and internationally important wetlands, such as the Ramsar-listed Hunter Estuary Wetlands.
- The Hunter Valley has a high degree of development and industry. It is the largest regional economy in Australia, driving around 28 percent of regional NSW's total economic output and accounts for the highest share of regional employment (22 percent).⁹ The region's economy is diverse, including significant mining, agriculture, tourism, viticulture, thoroughbred breeding and fisheries industries.
- The Hunter Valley and its water sources is an area of cultural significance to the Wanaruah, Worimi, Awabakal, Biripi, Kamilaroi, Darkinjung and Geawegal peoples. The region also includes Local Aboriginal Land Council areas of the Awabakal, Bahtabah, Mindaribba, Wanaruah, and Worimi.
- The climate in the Hunter region is highly variable, with streamflow influenced by multidecadal shifts between flood dominated and drought dominated regimes.¹⁰ Since 2017, the region has been experiencing severe drought conditions. Climate change projections indicate continued increases in average temperature, hot days and evapotranspiration. Rainfall predictions are less clear, although the majority of models indicate winter rainfall is likely to decrease, and the intensity of extreme rainfall events will increase.¹¹
- Most of the Hunter Valley's population is found on the coast, with over half in the Newcastle and Lake Macquarie areas. The population is expected to continue to increase over the next 20 years.

⁸ Clause 4 of the Plan.

⁹ 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.

¹⁰ Warner, R.F. (2009) 'Secular Regime Shifts, Global Warming and Sydney's Water Supply'. *Geographical Research* 47(3), pp. 227–241.

¹¹ OEH (2014) *Hunter Climate change snapshot*. Available at: <http://www.climatechange.environment.nsw.gov.au/~media/NARCLim/Files/Regional%20Downloads/Climate%20Change%20Snapshots/Huntersnapshot.pdf>.

2.1 Plan background

The Plan commenced on 1 August 2009 and was developed using the ‘macro’ planning approach.¹² In line with this approach, the Plan was amended in 2016 to include the former *Water Sharing Plan for the Wybong Creek Water Source 2003*.¹³ 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 changes to the provisions of the Wybong Plan were made due to prolonged suspension of the Wybong Plan, changes to policy, updates to legislation, updated data, outcomes of audits, and stakeholder requests.¹⁴

2.2 The Plan area and its water sources

Figure 2 shows the Plan area, which covers an area of more than two million hectares. The Hunter catchment extends further inland than any other coastal catchment in NSW. It is bordered in the north-west by the Liverpool Ranges and the west by the Great Dividing Range. The Plan extends to the Barrington Tops and Raymond Terrace in the north and north east and to Lake Macquarie in the south.¹⁵

Most of the water in the Hunter system comes from the north-eastern part of the catchment. The major tributaries of the Hunter River include:

- the Goulburn River, which drains almost half of the catchment but contributes only 23 percent of the river flow
- the Paterson and Williams rivers, which drain the wetter area to the north east of the catchment and rise in the Barrington Tops at elevations over 1,400 metres
- Wollombi Brook, which drains the south eastern segment of the catchment
- the Pages and Isis rivers, and Middle, Dart, Stewart, Moonan and Ormadale brooks, which are tributaries to the upper sections of the Hunter River
- Wybong Creek, which is the most eastern of the northern tributaries of the Goulburn River.¹⁶

Table 3 outlines the Plan’s 40 water sources,¹⁷ which – except for the Hunter Regulated River Alluvial Water Source and the tidal pool water sources – align with sub-catchment boundaries. Ten of the water sources are divided into management zones, where a finer resolution of rules is required. The water sources are divided into three extraction management units:¹⁸

¹² 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.

¹³ DPI-Water (2016) *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources -Background document for amended plan 2016*. Available at:

https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166849/hunter-unreg-alluvial-background.pdf.

¹⁴ *Ibid.*

¹⁵ *Ibid.*

¹⁶ *Ibid.*

¹⁷ Clause 4 of the Plan.

¹⁸ Department of Water and Energy (2016) *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009 - Background document for amended plan 2016*. Available at:

https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166849/hunter-unreg-alluvial-background.pdf.

- **Greater Hunter**, which covers most of the Plan area, including 36 water sources, 10 of the 11 water sources with high instream (ecological) value and all six water sources of high economic value.
- **Lake Macquarie**, which includes three water sources around Lake Macquarie in the south-east of the catchment, one of which has high instream value.
- **Hunter Regulated River Alluvium**, which is comprised of one water source that follows the main river channel through the centre of the Plan area.

The Plan covers all surface waters in the water source boundaries, as well as rivers, lakes, wetlands and all water in alluvial sediments below the Plan's boundaries.^{19,20} 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 areas covered under the water sharing plans for the Hunter and Paterson regulated river water sources.²¹ Land below the mangrove limit²² is excluded, except for Mannering Lake in the South Lake Macquarie Water Source and Belmont Lagoon in the North Lake Macquarie Water Source.²³

¹⁹ Part 1, Section 4, Clause 3 (a-c) of the Plan.

²⁰ Including any water contained in those unconsolidated alluvial sediments underlying the waterfront land within 1 metre of works taking water pursuant to licences issued under Part 5 of the *Water Act 1912* or their equivalent aquifer access licence issued under the Act, that are not part of the Hunter Regulated River Water Source.

²¹ Including any water contained in the unconsolidated alluvial sediments underlying the waterfront land of all rivers within the Hunter Regulated River Water Source, except as provided for in Subclause (3)(c) of the Plan.

²² Mangrove limit is defined as the mangrove that was growing furthest upstream in each river and creek (Department of Natural Resources (2006) *Survey of tidal limits and mangrove limits in NSW estuaries 1996 to 2005*. Available at: <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Water/Estuaries/survey-of-tidal-limits-and-mangrove-limits-in-nsw-estuaries-1996-2005.pdf>).

²³ Part 1, Section 4, Clause 4 (a-d) of the Plan.

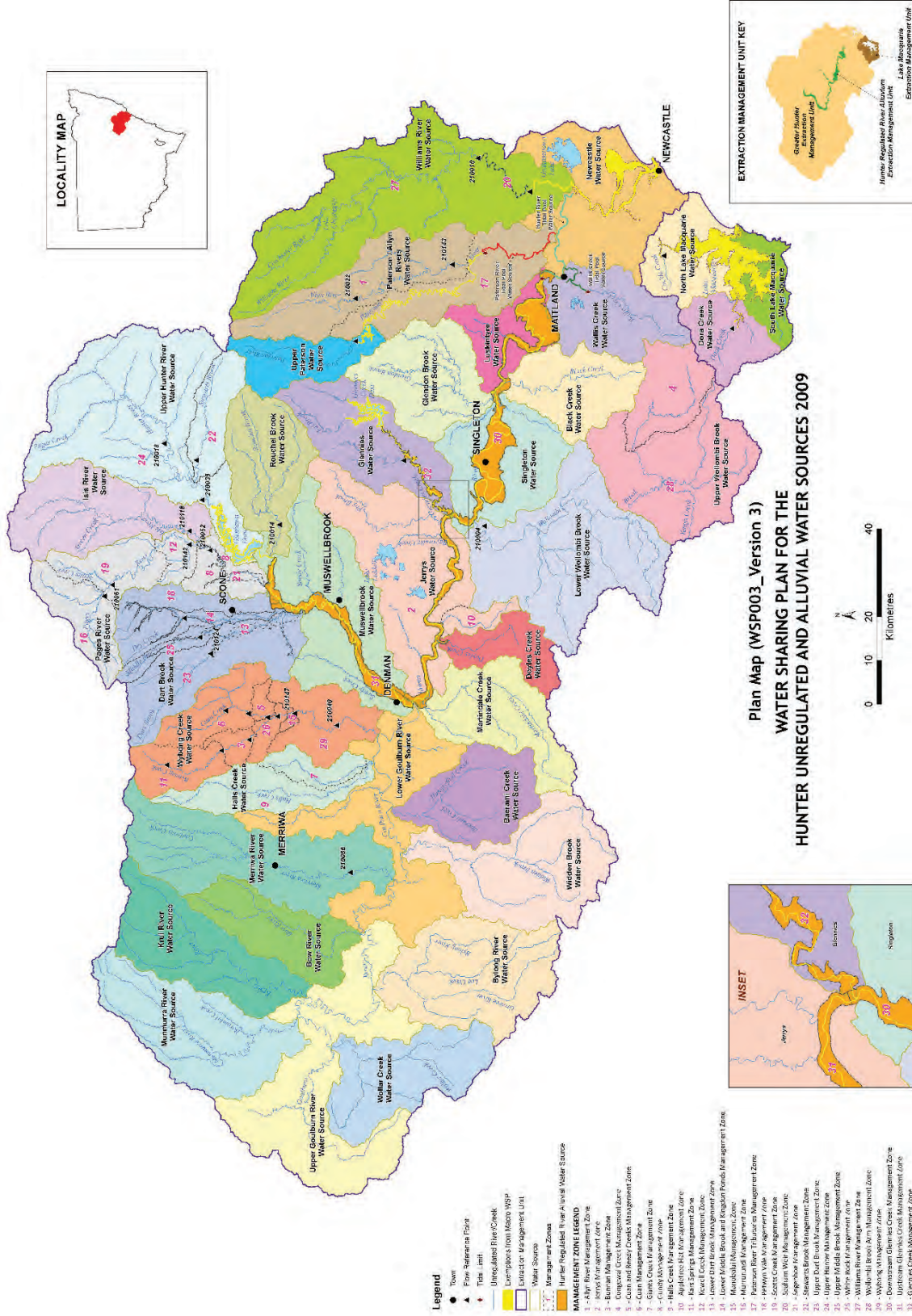


Figure 2: Plan area

Table 3: Water sources and extraction management units in the Plan area

Water source	Extraction management unit
Munmurra River	
Krui River	
Bow River	
Merriwa River	
Halls Creek	
Baerami Creek	
Widden Brook	
Bylong River	
Wollar Creek	
Upper Goulburn River	
Lower Goulburn River	
Dark Brook	
Pages River	
Isis River	
Upper Hunter River	
Rouchel Brook	
Muswellbrook	Greater Hunter
Jerrys	
Glennies	
Glendon Brook	
Luskintyre	
Singleton	
Martindale Creek	
Doyles Creek	
Lower Wollombi Brook	
Black Creek	
Wallis Creek	
Newcastle	
Paterson/Allyn River	
Williams River	
Upper Paterson	
Upper Wollombi Brook	
Wallis Creek Tidal Pool	
Paterson River Tidal Pool	

Water source	Extraction management unit
Hunter River Tidal Pool	
Wybong Creek	
North Lake Macquarie	
South Lake Macquarie	Lake Macquarie
Dora Creek	
Hunter Regulated River Alluvium	Hunter Regulated River Alluvium

2.3 Water entitlement and use

Based on publicly available data from the *NSW Water Register*, total water entitlements in the Plan are 557,861 share component units.²⁴ Most of this entitlement is distributed between major utility (62 percent), unregulated river (21 percent) and aquifer (16 percent) licences.²⁵ The remaining entitlement is distributed amongst other licence categories, for example local water utility, stock and domestic, and major utility (urban water) (**Table 4**).

Table 4: Summary of water entitlements based on water register data²⁶

Licence type	Sum of entitlements (ML)	Proportion of total entitlement (%)
Major utility (Hunter Water and AGL Energy Limited)	346,700	62
Unregulated river	115,299	21
Aquifer	89,260	16
Local water utility	5,418	<1
Domestic and stock	1,110	<1
Major utility (urban water)	75	<1
Total	557,862	

Share components listed in the Plan and share components listed in the 2018-19 *NSW Water Register* are different. This reflects that some licence types that previously did not have a share component (but were licenced to extract water at Plan commencement) now have share components listed on their licences. These include:

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

²⁵ Extraction limits for unregulated river access licences are expressed as unit shares. Allocations vary according to the AWD. The Commission calculated share entitlement based on Plan history of a 100 percent AWD per unit share.

²⁶ WaterNSW (2019) *Water Register*. Available at: <https://waterregister.watnsw.com.au/water-register-frame>. (accessed 26 September 2019).

- **the inclusion of tidal pool users** – this relates to the Wallis Creek (1,413 ML per year), Paterson River (10,965 megalitres (ML) per year) and Hunter River (11,552 ML per year) tidal pool water sources. Prior to Plan commencement, tidal pool access licences were not required under the *Water Act 1912*. The *Water Management (General) Further Amendment (Miscellaneous) Regulation 2009* now allows tidal pool water users to be licenced. This was based on history of water usage prior to August 2009.
- **previously non-volumetric licences being given volumes** – these licences were taking water at the commencement of Plan but did not have a volumetric limit. They now all have volumetric limits. This amounts to approximately 5,600 ML per year.

Hunter Water is the bulk water supplier in the Hunter region and is the single largest entitlement holder of unregulated water sources in the Plan area (346,700 ML per year).²⁷ However, its LTAAEL is set at 78,500 ML²⁸ per year and Hunter water have advised that their annual extraction is significantly less than their LTAAEL (see further discussion in **Section 4.2**).

The Plan area has several large water storages, including Grahamstown Dam and Chichester Dam, which store domestic water for urban centres in the lower Hunter Valley. It also has Lake Liddell (150,000 ML) and Lake Plashett (67,000 ML), which are used for water cooling for the Liddell and Bayswater coal fired power stations.

2.4 Regional climate and climate change

Climate in the Hunter Valley is variable depending on elevation and proximity to the ocean. The upper Hunter experiences distinct seasonal variations in temperature. The lower Hunter experiences less variation and milder conditions, with the warmest average winter temperatures and lower summer maximum temperatures.²⁹

The Hunter region sits in a transitional zone between areas with winter-dominant rainfall patterns and summer-dominant rainfall patterns. December and January tend to be the wettest months away from the coast. The highest rainfall occurs in the Barrington Tops region (1,600 millimetres per year) and coastal areas (1,140 millimetres per year at Newcastle). Rainfall decreases with distance inland, with rainfall at Cassilis around 620 millimetres per year.³⁰

Climate is highly variable over time, causing both serious droughts and floods.³¹ Streamflow in the Hunter catchment is influenced by multidecadal shifts in rainfall known as secular variation,³² moving between flood dominated and drought dominated regimes over periods of

²⁷ Department of Water and Energy (2016) *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009 – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166849/hunter-unreg-alluvial-background.pdf.

²⁸ Clause 44(3) and Clause 44(4) of the Plan.

²⁹ OEH (2014) *Hunter Climate change snapshot*. Available at: <http://www.climatechange.environment.nsw.gov.au/~media/NARCLim/Files/Regional%20Downloads/Climate%20Change%20Snapshots/Huntersnapshot.pdf>.

³⁰ Department of Water and Energy (2016) *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009 – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166849/hunter-unreg-alluvial-background.pdf.

³¹ *Ibid.*

³² Erskine, W.D. and Warner, R.F. (1988) 'Geomorphic effects of alternating flood- and drought-dominated regimes on NSW coastal rivers'. *Fluvial Geomorphology of Australia*, pp. 223-244.

20-50 years.³³ A shift to a drought dominated regime can reduce flows significantly. For example, a study in the Sydney Basin reported inflows to reservoirs under the current drought dominated regime could be as low as 25 percent of the long-term average.³⁴

Climate variability and climate change creates challenges for future water management in the region. The NSW Government has undertaken climate modelling for the Hunter Valley as part of the NSW and ACT Regional Climate Modelling (NARCLiM) project, which produced a suite of 12 regional climate projections for south-east Australia across a range of likely climate scenarios.³⁵

Temperature is currently the most reliable indicator of climate change, with all NARCLiM models indicating that:³⁶

- there will be an increase in all temperature variables (minimum, maximum and average) in the near and far future:
 - maximum temperatures will increase by 0.7 degrees Celsius in the near future (2020-2039) and 2 degrees Celsius in the far future (2060-2079)
 - minimum temperatures will increase by 0.7 degrees Celsius in the near future and 2.1 degrees Celsius in the far future
- there will be more hot days on average in the near future, with the greatest increase occurring in the upper Hunter (an additional five to 10 days per year in the near future and over 20 additional days in the far future).

Future changes in rainfall patterns are more challenging to model due to the complexities of weather systems that generate rain. As such, there is greater uncertainty around potential changes to rainfall, including average levels, seasonality and extremes such as drought and floods.³⁷ While the majority of models indicate that autumn rainfall will increase and spring rainfall will decrease in the near future, there is significant variation in most projections. For example, near future projections for autumn range from a decrease of 19 percent to an increase of 48 percent.³⁸

While changes in rainfall are harder to predict, changes in evapotranspiration – another key driver of water availability – are projected to increase in all seasons with a high level of certainty based on modelling by CSIRO.³⁹

Studies to improve our understanding of how climate change and variability will impact on water resources in the Plan area have occurred during the Plan period and continue to be a research focus. The *Greater Hunter Regional Water Strategy* included modelling to test if infrastructure options would still be viable under climate change projections, with the models

³³ Warner, R.F. (2009) 'Secular Regime Shifts, Global Warming and Sydney's Water Supply'. *Geographical Research* 47(3), pp. 227–241.

³⁴ *Ibid.*

³⁵ OEH (2014) *Hunter Climate change snapshot*. Available at: http://www.climatechange.environment.nsw.gov.au/~/_/media/NARCLiM/Files/Regional%20Downloads/Climate%20Change%20Snapshots/Huntersnapshot.pdf.

³⁶ *Ibid.*

³⁷ *Ibid.*

³⁸ *Ibid.*

³⁹ Dowdy, A. et al. (2015) *East Coast Cluster Report, Climate Change in Australia Projections for Australia's Natural Resource Management Regions: Cluster Reports*. Available at: https://www.climatechangeinaustralia.gov.au/media/ccia/2.1.6/cms_page_media/172/EAST_COAST_CLUSTER_REPORT_1.pdf.

used for planning and management of the Hunter and Paterson regulated rivers adjusted to incorporate increases in evapotranspiration. This modelling found the Greater Hunter region's water supplies are highly sensitive to changes in evaporation due to high number of shallow storages.

Hunter Water has also funded studies to test NARCLiM rainfall data on the Williams River, finding that the data lacked the ability to predict extreme events.⁴⁰

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.⁴¹ The Commission understands that DPIE-Water is building on the work undertaken in the Hunter to develop methods to better understand and address climatic risk to water management outcomes across NSW.⁴² This includes developing methods to incorporate climate change information based on DPIE-EES' NARCLiM climate modelling project to overcome the issues identified in the Hunter Water funded study. This new work includes a more comprehensive representation of natural variability and integrates climate change projections, especially of increased evaporative demand.⁴³ The project also extends climate information to 10,000 years of data using statistical techniques.

2.5 Drought conditions since 2017

Like much of NSW, the Hunter Valley has experienced extended dry conditions since early-2017.⁴⁴ For example, the three-year rolling average annual rainfall for 2017-19 at Aberdeen in the upper Hunter Valley was the lowest since records began in 1926.⁴⁵ In 2019, mean annual discharge at Wybong Creek in the upper Hunter Valley was the lowest on record (since 1955, 0.058 ML per day).⁴⁶ Hunter Water's major storages recorded their lowest levels in 35 years in February 2020, with 38 percent for Chichester Dam and 53.5 percent for Grahamstown Dam.⁴⁷

Significant rainfall events in early-2020 have seen Chichester Dam filled to 100 percent capacity, but Grahamstown Dam levels have only increased by around 7 percent, to 60.7 percent.⁴⁸

⁴⁰ Lockart N, Willgoose G, Kuczera G, Kiem AS, Chowdhury A, Parana Manage N, Zhang L, Twomey C (2016) 'Case study on the use of dynamically downscaled climate model data for assessing water security in the Lower Hunter region of the eastern seaboard of Australia', *Journal of Southern Hemisphere Earth System Science* 66(2), pp. 177-202.

⁴¹ 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(12), pp. 6399-6414. Available at: <https://www.hydrol-earth-syst-sci.net/22/6399/2018/>.

⁴² Personal communication, DPIE-Water, 28 August 2019.

⁴³ The NARCLiM 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>); and Personal communication, DPIE-Water, 28 August 2019.

⁴⁴ Bureau of Meteorology (2020) *Drought – Rainfall deficiencies and water availability*. Available at: <http://www.bom.gov.au/climate/drought/>.

⁴⁵ Bureau of Meteorology (2020) *Monthly Rainfall – Aberdeen (Rossgole)*. Available at: http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=139&p_display_type=dataFile&p_startYear=&p_c=&p_stn_num=061065 (accessed 30 March 2020).

⁴⁶ Water NSW (2020) *Real time data - state overview*. Available at: <https://realtimedata.waternsw.com.au/>.

⁴⁷ Hunter Water (2020) *Water Storage*. Available at: <https://waterstorage.hunterwater.com.au/> (accessed 30 March 2020).

⁴⁸ Hunter Water (2020) *Water Storage*. Available at: <https://waterstorage.hunterwater.com.au/> (accessed 30 March 2020).

Despite these rainfall events, the majority of the Hunter Valley remains categorised as being either in drought or weakening drought.⁴⁹ This reflects the extent of on-going drought conditions being experienced and that indicators such as soil moisture and plant growth show delayed change or need more rain to respond.⁵⁰ As of March 2020, the region is under Stage 1 water restrictions.⁵¹

Several stakeholder submissions raised concerns about the impact of drought since 2017 on the ability for the Plan to achieve environmental, social and economic outcomes, for example:

'Our family has owned property alongside the Dartbrook for over 60 years and during that time we have seen a depreciation in the water resources in the Dartbrook system. While climatic and weather conditions vary with numerous droughts and floods during that period, the noticeable drying of the environment has combined with an apparent significant increase in use which has currently resulted in water being almost inaccessible to most landholders in our area'.⁵²

DPIE-Water has forecast that without significant river flows there will be low to zero allocations for general security users on the Hunter Regulated River. This will impact the Hunter alluvial water users cover by this Plan.⁵³

Drought response is the primary focus of future water planning, with the *Greater Hunter Regional Water Strategy* identifying drought as the most significant risk to water security in the future.

2.6 Geology and hydrogeology

Most of the southern tributaries of the Hunter and Goulburn Rivers flow through Triassic sandstones and tend to have bed load sediments consisting largely of sand. The northern tributaries mainly flow through Tertiary basalt rocks in the west and Carboniferous rocks in the north and have cobble-gravel beds. The central part of the Hunter catchment consists of Permian rocks which were laid down in a marine environment. As a result, many of the streams in this part of the catchment have relatively higher salinity levels.⁵⁴

The aquifers across the Plan area are grouped into five categories, including up-river alluvial, coastal floodplain alluvial, coastal sands, fractured rock and porous rock.⁵⁵ The Plan only directly manages alluvial aquifers. The *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* provides management rules in relation to fractured and porous rock aquifers in the Hunter Valley and the *Water Sharing Plan for the North Coast Coastal*

⁴⁹ NSW DPI (2020) *NSW state seasonal update – April 2020*. Available at: <https://www.dpi.nsw.gov.au/climate-and-emergencies/seasonal-conditions/ssu/nsw-state-seasonal-update-april-2020>.

⁵⁰ *Ibid.*

⁵¹ Hunter Water (2020) *Water Storage*. Available at: <https://waterstorage.hunterwater.com.au/> (accessed 30 March 2020).

⁵² Submission: Individual - William Paradise, received 13 September 2019.

⁵³ NSW DPIE (2020) *Water allocation statement*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0016/293200/WAS-hunter-regulated-20200320.pdf.

⁵⁴ Department of Water and Energy (2016) *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009 – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166849/hunter-unreg-alluvial-background.pdf.

⁵⁵ *Ibid.*

Sands Groundwater Sources 2016 provides management rules in relation to coastal sands aquifers within the Hunter catchment.⁵⁶

The up-river and coastal floodplain alluvial aquifers are categorised based on the type of alluvial material and degree of connectivity with surface water. These aquifers are connected to varying extents with each other and the river system.⁵⁷ The alluvial aquifers are recharged from rainfall, river seepage and upwelling from Permian fractured rocks. There are two categories of alluvial aquifers:⁵⁸

- **shallow upriver alluvials** – which are highly connected to their adjacent streams
- **coastal floodplain alluvials** – which have a small interchange between surface and groundwater.

The rules in the Plan focus on the highly connected upriver alluvial systems. Alluvial aquifers are managed within the same unit as unregulated rivers and are considered very connected. The connectivity between the rivers and alluvial aquifers varies spatially and is evident in the ‘gaining’ and ‘losing’ sections of the river systems. Connectivity facilitates freshwater recharge to shallow groundwaters and is an important source of useable water.⁵⁹

2.7 Environmental context

The lower Hunter River catchment is relatively flat, with a large floodplain up to 40 kilometres across. The upper catchment is narrower, ranging from about 3-24 kilometres wide. The remainder of the catchment is comprised of undulating country and steep slopes in the Barrington Tops.⁶⁰

The Hunter Valley is ecologically significant and supports significant diversity because it:

- represents the only major break in the Great Dividing Range, providing a link between coastal and inland NSW⁶¹
- contains an area of overlap between tropical and temperate zones, in which the limits of many species are found⁶²
- stretches further inland than many other coastal valleys, meaning that the climate of the western Hunter Valley is more like that of the Murray-Darling Basin tablelands and slopes.

The Hunter Valley contains approximately 116 national parks and nature reserves.⁶³ Wollemi National Park stretches across the south of the Hunter catchment and is part of the Greater Blue

⁵⁶ *Ibid.*

⁵⁷ *Ibid.*

⁵⁸ *Ibid.*

⁵⁹ *Ibid.*

⁶⁰ *Ibid.*

⁶¹ Australian Government (2018) *Bioregional Assessments – Hunter subregion*. Available at: <https://www.bioregionalassessments.gov.au/assessments/hunter-subregion>.

⁶² *Ibid.*

⁶³ 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.

Mountains World Heritage Area.⁶⁴ Barrington Tops National Parks is part of the Gondwana Rainforests of Australia World Heritage Area.

The Hunter catchment includes several large wetlands that are nationally or internationally important for waterbird habitat. The Ramsar-listed Hunter Estuary Wetlands include the Kooragang Nature Reserve (now part of Hunter Wetlands National Park) and the Hunter Wetlands Centre.⁶⁵ Other important wetlands include Hexham Swamp and the upland swamps of Barrington Tops.⁶⁶ The upland swamps of the Barrington Tops are located upstream of water extraction under the Plan, while the Kooragang Nature Reserve, Hunter Wetlands Centre and Hexham Swamp are downstream, and are therefore reliant on flows delivered under the Plan.

There have been significant changes to the Hunter River catchment since European settlement, including the clearing of native vegetation for agricultural and mining activities, larger more destructive flood events due to loss of vegetation, and historical overstocking. These changes have caused stream bed and bank erosion and wider and shallower streams in some areas.⁶⁷

Streams that have undergone major changes include the Goulburn and Bylong rivers, Widden, Wollombi and Dart brooks (including Kingdon Ponds), Baerami, Doyles, and Martindale creeks, and the lower Pages River. These streams generally have wide, incised, sandy channels (although Dart Brook and the Pages River have gravel beds) and lack flow reliability and drought refuge pools. Large-scale changes in fluvial geomorphology⁶⁸ have reduced instream habitat variability and water quality and resulted in the poor condition of some aquatic ecosystems in these rivers.⁶⁹

There are two estuarine areas in the Plan area. Freshwater inflow impacts on the functioning of an estuarine ecosystem to different extents. The Hunter River Estuary has medium sensitivity to reduced freshwater inflows (at low flow). Its large catchment area provides freshwater to the estuaries during floods and high flows. These large flows are important for prawn production and for triggering the upstream migration of bass. However, during low flows, saltwater has the potential to move upstream at a more rapid rate if extraction of water becomes too high. Lake Macquarie has a low sensitivity to inflows, because its salinity levels are similar to seawater and it is fed by relatively small streams.⁷⁰

The Plan's background document identified high instream ecological values associated with environmental factors in 11 of the Plan's 36 surface water sources. Factors used to determine

⁶⁴ DPIE-Water (n.d.) *Catchment snapshots – Hunter*. Available at: <https://www.industry.nsw.gov.au/water/basins-catchments/snapshots/manning>.

⁶⁵ NSW DPIE (2018) *Hunter Estuary Wetlands*. Available at: <https://www.environment.nsw.gov.au/topics/water/wetlands/internationally-significant-wetlands/hunter-estuary-wetlands>.

⁶⁶ DPIE-Water (n.d.) *Catchment snapshots – Hunter*. Available at: <https://www.industry.nsw.gov.au/water/basins-catchments/snapshots/manning>.

⁶⁷ Department of Water and Energy (2016) *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009 – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166849/hunter-unreg-alluvial-background.pdf.

⁶⁸ Erskine, W.D. and Warner, R.F. (1988) 'Geomorphic effects of alternating flood- and drought-dominated regimes on NSW coastal rivers'. *Fluvial Geomorphology of Australia*, pp. 223-244.

⁶⁹ Department of Water and Energy (2016) *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009 – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166849/hunter-unreg-alluvial-background.pdf.

⁷⁰ *Ibid.*

high instream ecological values included ‘the presence of threatened fauna and other biota that are likely to be affected by extraction’, as well as species diversity, wet flora quality, riparian vegetation, fish community integrity, listed wetlands, world heritage or wilderness values and whether the source is a drought refuge for platypus and other aquatic species. These water sources include Dora Creek, Glennies, Upper Paterson, Merriwa, Newcastle, Paterson/Allyn, Rouchel, Williams, Upper Goulburn, Upper Hunter and Upper Wollombi. Instream values are an important consideration when setting flow sharing rules.⁷¹

The Plan’s background document lists threatened flora and fauna species that occur within one or more of the Plan’s water sources, including the Adam’s emerald dragonfly (*Archaeophya adamsi*), booroolong frog (*Litoria booroolongensis*), Davies’ tree frog (*Litoria daviesae*), giant barred frog (*Mixophyes iteratus*), giant burrowing frog (*Heleioporus australiacus*), glandular frog (*Litoria subglandulosa*), green and golden bell frog (*Litoria aurea*), green-thighed frog (*Litoria brevipalmata*), Littlejohn’s frog (*Litoria littlejohni*), sphagnum frog (*Phyllorhina sphagnicolus*), red-crowned toadlet (*Pseudophryne australis*), stuttering frog (*Mixophyes balbus*), wallum froglet (*Crinia tinnula*), Australasian bittern (*Botaurus poiciloptilus*), black bittern (*Ixobrychus flavicollis*), comb-crested jacana (*Irediparra gallinacea*), freckled duck (*Stictonetta naevosa*), magpie goose (*Anseranas semipalmata*), *Phaius australis* (Southern swamp orchid) and *Maundia triglochinos*.⁷²

2.7.1 River condition

Broad information on river condition and ecological health is available in the *NSW State of the Environment* reporting (last undertaken in 2018 by the Environment Protection Authority (EPA)) and *NSW State of the Catchment* reporting (last undertaken in 2015 by the former OEH). *State of the Environment* reporting classifies the river condition of the Hunter catchment as moderate (on a scale of ‘very poor’ to ‘very good’).⁷³ The trend in river condition over time is unknown, as 2015 and 2018 *State of the Environment* reporting used the same data.

State of the Catchment reporting for the Hunter-Central Rivers region provides a broad indication of hydrology condition, fish condition and estuary condition and pressures. **Table 5** lists water quality, fish and hydrology indicators in the Plan area. While the overall hydrology condition for key water sources was reported to be good, indicators for specific ecological values such as fish are poor. River condition also varies significantly between water sources, ranging from very good to very poor.⁷⁴

⁷¹ *Ibid.*

⁷² *Ibid.*

⁷³ 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>).

⁷⁴ Healey, M., Raine, A., Parsons, L., and Cook, N. (2012) *River Condition Index in New South Wales: Method development and application*. Prepared for NSW Office of Water. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0004/548941/monitor_river_condition_index_method_development.pdf.

Table 5: Summary of environmental indicators in the Plan area⁷⁵

Indicator	Findings
General hydrology condition	Overall, rivers in the Plan area that have had hydrological studies were considered to have 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.
Fish Condition Index	The Fish Condition Index for the entire region was classified as very poor: <ul style="list-style-type: none"> ▪ 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 Lake Macquarie-Tuggerah Lake basin was in moderate condition and the Hunter basin was in poor condition.
Estuarine condition	Overall estuarine condition was classified as very good for Lake Macquarie. There was no data available to determine overall estuarine condition for the Hunter River and Glenrock Lagoon. Seagrass condition was classified as very poor and saltmarsh condition as good in the Hunter River.
Estuarine pressure	The Hunter River was classified as having high overall pressure and Lake Macquarie as having moderate pressure. Glenrock Lagoon was classified as having low overall pressure. Tidal flow pressure was classified as very high and cleared land and sediment input as high in both the Hunter River and Lake Macquarie. Nutrient input and fishing were also rated as high in the Hunter River, with population and disturbed habitat also high in Lake Macquarie. Trends in these pressures are not known.

The Commission recognises that there are several factors influencing river condition that are outside of the control of Plan provisions, such as land use, invasive species and recreational uses. Integrated catchment management should be applied as part of Plan implementation to address these issues (see **Section 9.4**).

2.8 Social context

Table 6 shows the Local Government Areas (LGAs) within the Plan area and their populations (noting that some LGAs, such as Singleton and Mid-Western Regional are only partly covered by the Plan).

Most of the population in the Hunter region is found on the coast, with over half the region's population in the Newcastle and Lake Macquarie LGAs (over 360,000 in 2018).⁷⁶ These LGAs have accounted for the largest population growth outside Sydney since 2011. Other major population centres in the Plan area are Maitland, Cessnock, Denman, Aberdeen, Merriwa, Singleton, Kurri Kurri, Muswellbrook, Scone and Branxton-Greta.⁷⁷

⁷⁵ NSW Government (2010) *State of the Catchments: Riverine ecosystems Hunter – Central Rivers region*. Available at: <https://www.environment.nsw.gov.au/resources/soc/huntercentralrivers/10440HUNTCEstuarine.pdf>.

⁷⁶ The sum of all LGAs which are entirely or partially included in the Plan area is 672,474, based on 2018 Australian Bureau of Statistics data.

⁷⁷ Department of Water and Energy (2016) *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009 – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166849/hunter-unreg-alluvial-background.pdf

The region's Aboriginal population is generally around the regional NSW average of 5.5 percent (overall NSW average is 2.9 percent) but it is higher than average in parts of the Upper Hunter including Muswellbrook (8.3 percent), Cessnock (7.2 percent) and Singleton (5.7 percent).

Table 6: Plan area LGAs, centres, population and Aboriginal and Torres Strait Islander population⁷⁸

LGA	Cities / towns (in the Plan area)	Population (2018)	% Aboriginal and Torres Strait Islander population (2016)
Cessnock	Cessnock, Kurri Kurri, Branxton-Greta	59,101	7.2
Dungog	Gresford, Clarence Town	9,346	2.8
Maitland	Maitland	83,203	5.3
Muswellbrook	Denman, Muswellbrook, Baerami, Widden	16,383	8.3
Port Stephens	Raymond Terrace	72,695	4.8
Lake Macquarie	Lake Macquarie	204,914	4.1
Newcastle	Newcastle	164,104	3.5
Upper Hunter Shire	Aberdeen, Merriwa, Scone, Murrurundi, Gundy	14,220	5.1
Singleton	Singleton, Broke	23,422	5.7
Mid-Western Regional	Bylong	25,086	5.4

The population in the Hunter region is expected to continue to increase over the next 20 years due to its proximity to Sydney and continued economic activity.⁷⁹ Population projections to 2036 are shown in **Figure 3**. The population will remain concentrated in the urban centres of Lake Macquarie and Newcastle LGAs, but Maitland and Cessnock LGAs continue to experience the largest population increases of all inland LGAs in NSW. The largest increases in population from 2016 to 2036 are predicted to occur in Cessnock (36 percent), Maitland (28 percent), Newcastle (20 percent), and Lake Macquarie and Port Stephens (11 percent each).⁸⁰ There are some areas where rural populations are declining, which impact the economic viability of agricultural and rural communities and the provision of infrastructure and services in these areas.

In line with these projections, the Hunter continues to be the fastest growing corridor in NSW, with the number of households also expected to increase by 22 percent across the whole region by 2036. The largest increases in housing stock are in Cessnock (42 percent), Maitland (36 percent) and Newcastle (23 percent).⁸¹ Concentrated population and household growth will increase water demands and poses significant challenges to town water supply (see **Section**

⁷⁸ Based on 2018 Australian Bureau of Statistics population data.

⁷⁹ NSW Department of Industry (2018) *Greater Hunter regional water strategy – Securing the future water needs of the Hunter, Central Coast and Mid-Coast areas*. Available at: <https://www.industry.nsw.gov.au/water/plans-programs/water-mgmt-strategies/greater-hunter-region>.

⁸⁰ DPIE (2010) *State of the catchments 2010: Hunter–Central Rivers region Economic sustainability and social well-being*. Available at: <https://www.environment.nsw.gov.au/soc/stateofthecatchmentsreport.htm>.

⁸¹ DPIE (2018) *NSW Population, Household and Dwelling Projections*. Available at: https://www.planning.nsw.gov.au/Research-and-Demography/Population-projections_

6.3).

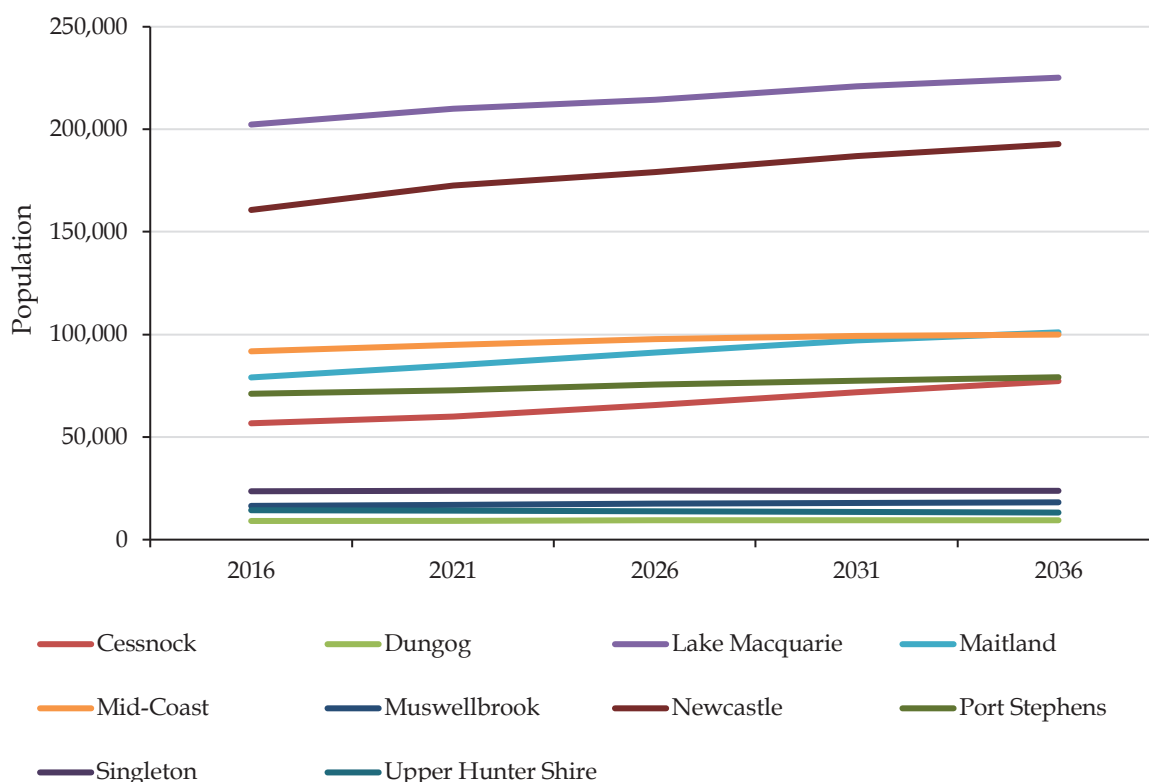


Figure 3: Population projections to 2036 for Hunter Region LGAs⁸²

The *Hunter Regional Plan 2036*⁸³ describes how increases in population and housing align with the Hunter’s role as the largest regional economy and employment centre in Australia (see also **Section 2.10**), including NSW’s most productive coal mining region, key electricity producer, most productive wine producing area, and the largest equine industry in Australia.⁸⁴

Many of these industries rely on the amenity and diversity of the region’s natural environment. Maintaining the scenic rural landscape of the Hunter region is important for a range of industries and complementary tourism activities. For example, the region aims to capitalise on the growth in food-based or gastronomic tourism to support growers of products such as olives, grapes and oysters, as well as the beef and dairy industries, and to align this growth with the leading vineyards of the Hunter Valley and the international centre of excellence for thoroughbreds in the Upper Hunter.⁸⁵

⁸² *Ibid.*

⁸³ DPIE (2016) *Hunter Regional Plan 2036*. Available at: <https://www.planning.nsw.gov.au/~media/Files/DPE/Plans-and-policies/hunter-regional-plan-2036-2016-10-18.ashx>.

⁸⁴ DoI (2018) *Greater Hunter regional water strategy – Securing the future water needs of the Hunter, Central Coast and Mid-Coast areas*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0008/196055/greater-hunter-regional-water-strategy.pdf.

⁸⁵ Department of Planning and Environment (2016) *Hunter Regional Plan 2036*. Available at: <https://www.planning.nsw.gov.au/~media/Files/DPE/Plans-and-policies/hunter-regional-plan-2036-2016-10-18.ashx>.

The coastal areas of the Hunter are some of the most visited and scenic parts of NSW, and the region also includes entry points to the Barrington Tops National Park, a World Heritage area (see **Section 2.6**).⁸⁶ There is significant potential for increases in tourism in the region and protecting the Hunter's natural areas ensures they remain attractive to visitors. As of 2019, the Hunter is NSW's:

- number 1 region for domestic day trip visitors and expenditure
- number 2 region for domestic overnight visitors and expenditure
- number 2 region for international visitors
- number 3 for international visitor expenditure in NSW.⁸⁷

The main activities undertaken by visitors involved the region's natural assets, including going to the beach, sightseeing and visiting national parks or state forests.

2.9 Cultural context

The Hunter Valley is an area of cultural significance to First Nation peoples including the Wanaruah, Worimi, Awabakal, Biripi, Kamilaroi, Darkinjung and Geawegal.⁸⁸ The region also includes Local Aboriginal Land Council areas of the Awabakal, Bahtabah, Mindaribba, Wanaruah, and Worimi (see **Figure 4**) and the Upper Hunter in particular is home to a significant Aboriginal population (see **Table 6**).

⁸⁶ *Ibid.*

⁸⁷ Destination NSW (2019) *Hunter Visitor Profile, September 2019* (source: National and International Visitor Survey, Tourism Research Australia. Available at: <https://www.destinationnsw.com.au/wp-content/uploads/2020/02/hunter-fact-sheet-ye-sep-19.pdf>).

⁸⁸ 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; Department of Planning and Environment (2016) *Hunter Regional Plan 2036*. Available at: <https://www.planning.nsw.gov.au/Plans-for-your-area/Regional-Plans/Hunter/Hunter-regional-plan>.



Figure 4: Native title claims and Local Aboriginal Land Council areas in the Plan area⁸⁹

⁸⁹ Sources: DPI spatial data, received November 2013; National Native Title Tribunal, accessed February 2020. Note: there are no native title determinations in the Plan area.

Nations in the Hunter Valley observe spiritual connections to these land and waters through Baiame. In the Dreaming Stories, all things were created by Baiame and the valley floor parted and what was to be the keeper of life was formed – the river. The Hunter River was called Coquun, Myan or Coonanbarra for the Aboriginal nations of the region.⁹⁰ This shows the importance of water to Aboriginal people.⁹¹ Aboriginal communities have a spiritual and customary living relationship with water in all its forms, through creation stories, use of water as a resource, and knowledge about sharing and conserving water.⁹² A history of dispossession from these lands and waters, and its associated impacts on cultural practice, have created a history of socioeconomic disadvantage.⁹³ Access to these lands and waters is entwined with not only the health of the environment but also the well-being of Aboriginal communities (see **Section 6.2**).

The Gomeri (also identified as Kamilaroi, Gomeroi, Gamilaraay, Gamilaroi and Kamilarai) is one of the four largest Nations in Australia, covering an area from the Hunter Valley north to Nindigully in Queensland and west to the Warrumbungle Mountains near Coonabarabran in NSW.⁹⁴ Water has been identified as a crucial element of traditional Gomeri life. Watering holes and rivers were valuable tributaries and critical to providing food, culture, shelter and water for survival.

The Gomeri have a current native title claim that covers parts of the Plan area in the Upper Hunter, as well as large parts of North West NSW (see **Figure 5**). Although notified in 2012, there has been little progress with this claim due to disputes over the legal representative for the native title claim group and members of the claim group.⁹⁵

The lands of the Wonnarua people stretch across areas of the Upper Hunter Valley. As with other Nations in the region, the Wonnarua observe deep spiritual connections to Country through a greater being named Baiame.⁹⁶ The spirit of Baiame is depicted in a painting created more than 3,000 years ago on a cave overlooking Milbrodale. Baiame also created Kawal to watch over the Wonnarua people. The spirit of Kawal is embodied in the wedge tailed eagle, found throughout the Hunter Valley.⁹⁷

The Wonnarua also have a current native title claim in the Plan area across 9,500 hectares, covering parts of the Maitland, Cessnock, Dungog, Muswellbrook, Singleton and Upper Hunter (see **Figure 5**). The claim has been subject to some disputes between the Applicant and

⁹⁰ Brayshaw, H. (1987) *Aborigines of the Hunter Valley – a study of colonial records*. Available at:

<https://downloads.newcastle.edu.au/library/cultural%20collections/pdf/brayshaw1987.pdf>.

⁹¹ 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; Department of Planning and Environment (2016) *Hunter Regional Plan 2036*. Available at:

<https://www.planning.nsw.gov.au/Plans-for-your-area/Regional-Plans/Hunter/Hunter-regional-plan>.

⁹² NSW Office of Water (2012) *Our Water Our Country*. Available at:

http://www.water.nsw.gov.au/__data/assets/pdf_file/0004/547303/plans_aboriginal_communities_water_sharing_our_water_our_country.pdf.

⁹³ Department of Environment, Climate Change and Water (2010) *State of the catchments 2010 Hunter–Central Rivers region Economic sustainability and social well-being*. Available at:

<https://www.environment.nsw.gov.au/soc/stateofthecatchmentsreport.htm>.

⁹⁴ Carpenter, M. (2017) *Kamilaroi – A Nations Identity*. Available at:

<https://kamilaroianationsidentity.weebly.com/location.html>.

⁹⁵ See further information: AIATSIS (2018) *What's new in native title?* Available at:

https://aiatsis.gov.au/sites/default/files/products/whats_new_in_native_title/whats_new_in_native_title_-_july_2018.pdf.

⁹⁶ Carpenter, M. (2017) *Kamilaroi – A Nations Identity*. Available at:

<https://kamilaroianationsidentity.weebly.com/location.html>.

⁹⁷ Wonnarua Nation (2018) *About Us*. Available at: <https://www.wonnarua.org.au/about-us-page-2/>.

Indigenous respondents.⁹⁸ However, the Native Title Tribunal accepted the claimants' cultural descendants and, as a result, mining companies must notify the Wonnarua descendants regarding new projects and modifications to existing projects. Pending the final outcomes of this native title claim, the Wonnarua people plan to seek compensation for the loss of spiritual and culturally significant land in the Hunter based on a recent successful case in the Northern Territory.⁹⁹ In addition, a separate application was lodged by the Wonnarua in late 2018 under the Commonwealth *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* to protect an area of land at Ravensworth where 18 Aboriginal people were massacred in 1826. If approved, it would be the first successful application made under the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Cwlth)* in NSW.¹⁰⁰

The Awabakal are the traditional owners of land from the Hunter River in the north to Tuggerah Lake in the south, bounded to the north-west by the Wonnarua, the Worimi to the north-east and the Darkinjung peoples to the west and south. The Awabakal are people of the coast, estuaries, lakes and wetlands but also have an attachment to the sandstone country of the Sugarloaf and Watagan Ranges. Fishing, particularly for shellfish, was a significant part of the Awabakal people's diet and culture, as well as hunting animals and collecting fruits and tubers. The Awabakal people also practised extensive firestick farming, which helped them to hunt and to navigate through dense prickly scrub along the coast. Belmont Lagoon is a place of cultural and spiritual significance, being the site of a major annual corroboree and the subject of a traditional story about the formation of the lagoon. Middens in the area provide evidence of thousands of years of Aboriginal occupation.¹⁰¹

The Worimi are the traditional owners of the Great Lakes and Port Stephens areas between the Hunter and the Manning rivers. The landscape includes several Aboriginal cultural sites, including burials, campsites and middens. The Worimi people had direct access to marine resources from the ocean, estuarine resources, 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 fishing and spearing. Women used fishing lines (yirawaan) and typically fished from canoes (guuyang), while men also speared fish from canoes and the shoreline. The Worimi people used the beaches to travel between the northern and southern parts of their country. They now manage these areas around Stockton Bight as the Worimi Conservation Lands through a joint agreement with NSW National Parks and Wildlife Service.¹⁰²

The traditional boundaries of Darkinjung (Darkinyung) extend from the Hawkesbury River in the south, Lake Macquarie in the north, the McDonald River and Wollombi up to Mt Yengo in the west and the Pacific Ocean in the east. Darkinyung Territory embraces the Country watered

⁹⁸ See further detail at: Wonnarua Nation (2015) *PCWP Native Title Claim*. Available at: <http://www.wonnarua.org.au/pcwp-native-title-claim/>; AIATSIS (2015) *Native Title in the News - January 2015*. Available at: <https://aiatsis.gov.au/publications/products/native-title-news-january-2015>.

⁹⁹ This is based on a High Court judgement made in March 2019 where the Northern Territory government was ordered to pay \$2.53 million in compensation to a group of native title holders. It was the first time the court has considered the monetary value of native title and compensation for the removal of land rights. The case was considered one of the most significant land rights cases since the Mabo ruling. (Kelly, M. (2019) 'Loss of Aboriginal cultural land could result in compensation payout', *Newcastle Herald*, March 26. Available at: <https://www.newcastleherald.com.au/story/5973062/loss-of-aboriginal-cultural-land-could-result-in-compensation-payout/>).

¹⁰⁰ Kelly, M. (2018) 'Commonwealth protection sought for land where 18 Aboriginals were massacred in 1826', *Newcastle Herald*, December 2. Available at: <https://www.newcastleherald.com.au/story/5779093/massacre-site-or-mine-site-ravensworths-bloody-history/>.

¹⁰¹ Awabakal Local Aboriginal Land Council (2016) *About the Awabakal People and their Lands*. Available at: <https://www.awabakallalc.com.au/about-us/>.

¹⁰² Worimi Conservation Lands (2019) *History of the Park*. Available at: <https://worimiconservationlands.com/>.

by Colo, MacDonald and Wollombi Rivers, with numerous other tributaries. There was likely a zone between surrounding groups which was shared by neighbouring groups.¹⁰³

There is much evidence of Aboriginal peoples' long connection with these lands and waters, with many registered and unregistered sites and values of cultural significance throughout the region¹⁰⁴, including:

- ceremonial areas and sites
- extensive sandstone rock art, including engraved or pigment art of Anthropomorphic like figures
- stone artefact scatters
- tool-making areas
- ochre quarries
- resource gathering and hunting areas.¹⁰⁵

There are also several sources of information on cultural sites and values in the region, such as plans of management for the region's national parks and other reserves¹⁰⁶, Aboriginal cultural assessments undertaken for mining operations¹⁰⁷, and cultural sites registered as part of the Aboriginal Heritage Information Management System (AHIMS).¹⁰⁸ Although these sources of information have significant limitations, they provide a foundation for identifying cultural values and uses in the Plan area that have not been adequately accounted for in the current Plan (see **Section** Aboriginal values, rights and interests should be better supported**6.2**).

2.10 Economic context

The Hunter Valley has the largest regional economy in Australia, driving around 28 percent of regional NSW's total economic output. It is the largest regional contributor to gross state

¹⁰³ Darkinjung Local Aboriginal Land Council (2018) *Our Nation*. Available at: <http://www.darinyinjung.com.au/88>.

¹⁰⁴ For example, the Darkinjung Local Aboriginal Land Council note 2,985 registered Aboriginal sites in 2019, located within the Darkinjung Local Aboriginal Land Council boundaries (Darkinjung Local Aboriginal Land Council (2018) *Our Nation*. Available at: <http://www.darinyinjung.com.au/88>).

¹⁰⁵ Hunter-Central Rivers Catchment Management Authority (2013) *Hunter-Central Rivers Catchment Action Plan 2013–2023*. Available at: http://hunter.lls.nsw.gov.au/_data/assets/pdf_file/0020/493130/huntercentralriverscap.pdf.

¹⁰⁶ 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>.

¹⁰⁷ The NSW *Environmental Planning and Assessment Act 1979 (State Significant Development)* requires mining developments to consider Aboriginal cultural heritage and other legislation such as the *National Parks and Wildlife Act 1974* and *Heritage Act 1977*. The Secretary's *Environment Assessment Requirements for State Significant Development* usually sets out several specific requirements for mining assessments which can include assessment of the Aboriginal and heritage impacts of the development (cultural and archaeological surveys) and the preparation of an Aboriginal cultural heritage management plan (NSW Government (2019) *State Significant Development*. Available at: <https://www.planning.nsw.gov.au/Assess-and-Regulate/Development-Assessment/Planning-Approval-Pathways/State-Significant-Development>.

¹⁰⁸ 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>).

product (\$38.5 billion), has the largest share of regional population (21 percent) and accounts for the highest share of employment (22 percent).¹⁰⁹

Economic data for the Hunter Valley provided by the Australian Bureau of Statistics do not exactly correspond to the Plan boundaries but provide an indicative figure of employment in and around the Plan area. Health care and social assistance is the largest employer in the Hunter Valley (excluding Newcastle), employing 18,300 people in 2019, followed by construction (14,500 people) and accommodation and food services (11,700 people). Other important employment sectors in the region are mining, public administration and safety, and retail trade. The agriculture, forestry and fishing sector employed 5,000 people (or 4 percent of the region's workforce).¹¹⁰

The Hunter region's economy is dominated by mining:

- Coal mining has been and remains the region's largest primary industry and the Hunter Valley Coal Chain is the largest coal export operation in the world. The Hunter Coalfields produced 59 percent of NSW's coal production (149 million tonnes), with saleable coal valued at \$8.4 billion.¹¹¹ Coal mining increased significantly over the Plan period, with associated growth in water entitlements for mining (see **Section 7.1**). Mining is expected to continue as a major industry in the medium to longer term.¹¹²
- The total gross value of the agricultural industry in the Hunter Valley (excluding Newcastle) in 2017-18 was over \$309 million.¹¹³ The most valuable agricultural production in the region comes from cattle and calves (\$129 million), followed by milk (\$70 million) and poultry (\$46 million).¹¹⁴
- There is a strong tourism industry, with over 10 million international and domestic visitors in 2016-17. Investment in a new Newcastle Cruise Terminal is likely to drive increases to tourism.¹¹⁵
- The Hunter Valley is Australia's oldest wine region. Grape and wine production is valued at more than \$210 million per year and the total value of investment expenditure directly associated with grape and wine production is over \$450 million. In addition, wine-related tourism in the region generates over \$1 billion per year.¹¹⁶

¹⁰⁹ 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.

¹¹⁰ Based on 2018 Australian Bureau of Statistics quarterly labour force data from May 2019 for the Hunter Valley excluding Newcastle (ABARES (2019) *About my region – Hunter Valley (excluding Newcastle) New South Wales*. Available at: <http://www.agriculture.gov.au/abares/research-topics/aboutmyregion/nsw-hunter>).

¹¹¹ 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.

¹¹² *Ibid.*

¹¹³ Based on 2018 Australian Bureau of Statistics data on value of agricultural commodities produced 2017-18 for the Hunter Valley excluding Newcastle (ABARES (2019) *About my region – Hunter Valley (excluding Newcastle) New South Wales*. Available at: <http://www.agriculture.gov.au/abares/research-topics/aboutmyregion/nsw-hunter>).

¹¹⁴ ABARES (2019) *About my region – Hunter Valley (excluding Newcastle) New South Wales*. Available at: <http://www.agriculture.gov.au/abares/research-topics/aboutmyregion/nsw-hunter>.

¹¹⁵ Regional NSW (2018) *Hunter*. Available at: <https://www.investregional.nsw.gov.au/regions/hunter/#47>.

¹¹⁶ DPI (2013) *Upper Hunter Region Viticulture Profile*. Available at: https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0005/471029/viticulture-profile-upper-hunter-region.pdf.

- The Upper Hunter (Muswellbrook, Singleton, Dungog and Gloucester) is internationally known for thoroughbred breeding and is ranked second in the world for the concentration of thoroughbred stud properties, quality and number of bloodlines.¹¹⁷
- Port Stephens and Nelson Bay fall in the Plan area and provide important fisheries and sources for recreational fishing. The main fishery products in the region are Sydney rock oysters, prawns, eastern tuna and billfish.¹¹⁸ Coastal parts of the Hunter are popular for recreational fishing, including competitions. Estimates indicate that tournament fishing brings around \$20 million per year to Port Stephens economy.¹¹⁹

The main commercial water uses in the Plan area are irrigation, power generation, coal mining and other industrial purposes.¹²⁰ Six of the Plan's water sources were classified as having a high economic dependence on commercial extraction:

- Black Creek, for vineyards and tourism
- Dartbrook, for irrigated agricultural production (lucerne) and horse studs
- Halls Creek for irrigated agricultural production
- Lower Goulburn for vineyards and horse studs
- Lower Wollombi for vineyards
- Pages River for horse studs.¹²¹

¹¹⁷ DPI (2013) *Upper Hunter Region Equine Profile*. Available at: https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0003/471027/equine-profile-upper-hunter-region.pdf.

¹¹⁸ ABARES (2019) *About my region – Hunter Valley (excluding Newcastle) New South Wales*. Available at: <http://www.agriculture.gov.au/abares/research-topics/aboutmyregion/nsw-hunter>.

¹¹⁹ *Ibid.*

¹²⁰ WaterNSW (2018) *20 Year Infrastructure Options Study Rural Valleys Summary Report*. Available at: https://www.watnsw.com.au/__data/assets/pdf_file/0019/132616/20-Year-Infrastructure-Options-Study-June-2018.pdf.

¹²¹ Department of Water and Energy (2016) *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009 – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166849/hunter-unreg-alluvial-background.pdf.

3 Overall advice on Plan extension and replacement

3.1 The Plan should be extended and replaced to address risks to outcomes

The Commission's review has identified a range of issues that justify replacing the Plan. Major issues include:

- The Plan does not set clear, numeric extraction limits or account for all water take and has provisions to allow increased water entitlements (see **Chapter 4**). Regional planning processes have identified significant risks to environmental, social and economic outcomes under current water allocations, many of which have been further highlighted by the drought conditions experienced since early 2017. The Plan should strengthen provisions to ensure take is within sustainable limits.
- The Plan was developed as a transitional Plan and stated that more knowledge was needed to adequately protect water sources. Studies for key provisions such as cease to pump rules (see **Chapter 5**) remain outstanding and comprehensive monitoring has not been implemented to ensure outcomes are being met (see **Chapter 8**).
- The Plan is inconsistent in the way key provisions have been implemented and creates the potential for inequity between water users, which has led to unnecessary misunderstanding and confusion (see for example, cease to pump provisions in **Chapter 5**). The Plan needs to address the potential for inequity and clearly communicate Plan provisions and their justification through strong stakeholder engagement approaches (see **Chapter 9**).
- The Plan has not adequately considered cultural water values in the area or supported cultural water access and use (see **Chapter 6**).

Given these issues, the Plan does not adequately manage a range of risks to environmental, social and economic outcomes. The Commission recommends replacing the Plan to strengthen rules protecting environmental outcomes in accordance with the priority they are afforded under the Act, as well as supporting social, cultural and economic outcomes. Replacing the Plan will provide an opportunity to increase the equity and appropriateness of other rules governing how much, when and where water can be extracted.

3.2 The Plan should align with other Greater Hunter water planning processes

The Plan sits in the Greater Hunter region, which includes the Hunter Valley, Lower North Coast and Central Coast. There are several other water sharing plans in this region, including the:

- *Water Sharing Plan for the Hunter Regulated River Water Source 2016* (the Hunter Regulated Plan)
- *Water Sharing Plan for the Paterson Regulated River Water Source 2019* (the Paterson Regulated Plan)
- *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources 2009* (the Lower North Coast Plan)
- *Water Sharing Plan for the North Coast Coastal Sands Groundwater Sources 2016* (the North Coast Coastal Sands Plan)

- *Water Sharing Plan for the Central Coast Unregulated Water Sources 2009* (the Central Coast Plan)
- *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* (the North Coast Fractured and Porous Rock Plan)

Since the Plan was developed, the understanding of the interactions between surface and groundwater across the region has improved through studies undertaken for the Australian Government's Bioregional Assessment for the Hunter subregion.¹²² The understanding of end of system flow requirements has also improved through the Hunter Valley Hydrodynamic Platform and Model(s) Project, which developed a whole-of-government (NSW Government and local government) hydrodynamic model of the Hunter estuary.¹²³

In general, runoff from rainfall across the catchment is covered under the Plan. Some of that water enters the alluvial groundwater, which is also covered by the Plan. Most of the water from unregulated streams above Maitland eventually enters the Hunter and Paterson regulated rivers, which are covered by the Hunter Regulated Plan and the Paterson Regulated Plan. Water from the regulated rivers then recharges the regulated alluvial groundwater (covered by this Plan), especially during times in low rainfall. From here the water can enter the fractured and porous rock aquifers that underly the Hunter Valley, which are covered by the North Coast Fractured and Porous Rock Plan.

Recognising the connectivity between water sharing plans is critical to protect environmental assets, which – in the case of the Ramsar-listed Hunter Estuary Wetlands – is required to meet international obligations. Maintaining the Hunter Estuary Wetlands' characteristics and ecosystem function requires sufficient and well-timed end of system flows from the Hunter Regulated River Water Source, the Paterson Regulated River Water Source and the Williams River Water Source (which is managed under the Plan). This was recognised in stakeholder submissions:

'The presence of Ramsar listed wetlands in the Hunter estuary is an important aspect of water management planning and sharing in the Hunter Region. Connectivity between water sources must be taken into consideration'.¹²⁴

Other key connections between Greater Hunter water sharing plans include:

- Extraction from the Hunter Regulated River Alluvial Water Source (managed under this Plan) can impact on the reliability of essential services such as power generation that rely on water in the connected Hunter Regulated River.
- Regulated water is supplied to water users from Glenbawn Dam and Glennies Creek Dam. Dam releases are calculated based on:
 - water orders
 - river losses from evaporation and losses to groundwater
 - inflows from the unregulated rivers.

The inflows from the unregulated rivers are managed through the LTAAEL (see **Chapter 4**) and cease to pump rules (see **Section 5.2**). If cease to pump rules are lowered or the

¹²² Australian Government (2018) *Bioregional Assessments – Hunter subregion*. Available at: <https://www.bioregionalassessments.gov.au/assessments/hunter-subregion>.

¹²³ University of NSW (n.d.) *Water Research Laboratory – Hunter Scoping Study*. Available at: <http://www.wrl.unsw.edu.au/sites/wrl/files/uploads/PDF/Hunter-Scoping-Study.pdf>.

¹²⁴ Submission: Nature Conservation Council, received 25 October 2019.

LTAAEL increased in the unregulated system, the amount of water for regulated river users is reduced.

- All major towns in the mid and upper Hunter rely on a combination of regulated and unregulated river water. Some irrigators also use a combination of unregulated and regulated water. For example, the community-led Pokolbin Pipeline Project supplies 384 properties over 500 square kilometres with water, catching water in farm dams that are supplemented with water from the regulated river.¹²⁵
- The Plan's alluvial water sources both recharge and are recharged by Permian fractured rocks and porous rock aquifers managed under the North Coast Fractured and Porous Rock Plan.

In addition to the natural connectivity between the water sources managed under the different water sharing plans in the Hunter Valley, infrastructure also moves water around the region. For example, the Barnard River Scheme, which supplies water to Bayswater and Liddell power stations, extracts water from water sources managed by the Lower North Coast Plan and pumps it into the unregulated Plan area. It then stores and releases water under the Hunter Regulated Plan before finally either being stored in Lake Plashett and Lake Liddell, which are covered by this Plan. The Hunter Connection pipeline also supplies water between the Hunter Valley and the Central Coast.

The connectivity between Greater Hunter water sharing plans affects how much water is available to be taken under this Plan (**Chapter 4**), when this take can occur (**Chapter 5**), who can access water (**Chapter 6**), where this take can occur (**Chapter 7**), and the effectiveness of water and associated infrastructure investment across the region.

As such, review, amendment and replacement processes for these plans should be aligned where possible across the region to ensure relative contribution to environmental flows and the interaction between rules of the various plans can be better coordinated.

The current schedule for review of Greater Hunter water sharing plans is provided in **Table 7**. The timing of these reviews should be revisited considering the recommendations of this report.

Table 7: Timing of Greater Hunter water sharing plan reviews

Water sharing plan	Review due date based on plan expiry
Lower North Coast Plan	July 2020 (review completed)
Central Coast Plan	July 2020 (review completed)
Hunter Regulated Plan	July 2026
North Coast Coastal Sands Plan	July 2026
North Coast Fractured and Porous Rock Plan	July 2026
Paterson Regulated Plan	July 2029

¹²⁵ Cordell (n.d.) *Hunter River to Pokolbin Pipeline*. Available at: <https://www.cordellconnect.com.au/public/project/ProjectDetails.aspx?uid=360334>.

In addition to the Greater Hunter water sharing plans, the NSW Government has also released the *Greater Hunter Regional Water Strategy*, in recognition of the important economic contribution of the Greater Hunter region and increasing risks to water security. The strategy aims to manage issues and risks that cannot be addressed in a single water sharing plan over the next 30 years.

The strategy includes significant investment in infrastructure and other actions that will have implications for water sharing plans and should be considered as part of the review. For example, a two-way transfer of water from Lostock Dam on the Paterson Regulated River to Glennies Creek in the Hunter Regulated River will change the relative end of system flows from these plan areas. This will require the maintenance of current levels of protection for the estuary covered by the unregulated Plan. Similarly, treated wastewater may also be transferred from the lower Hunter (Hunter Water) urban area to industry and agriculture in the upper Hunter, reducing the stress on some unregulated rivers.

Hunter Water's *Lower Hunter Water Plan* – a package of water supply and demand measures – is currently being revised, which may impact on water sharing arrangements.¹²⁶ The new plan is estimated for release in 2021, which allows for the integration of provisions to be included in the replacement Plan by 2022.

The Commission recommends the Plan is extended for two years to 2022 (in line with the maximum amount of time a Plan can be extended prior to replacement under Section 43A(6) of the Act), with amendments undertaken in the interim to address critical issues. This will allow for better alignment with the implementation of key infrastructure changes and other actions under the *Greater Hunter Regional Water Strategy* and *Lower Hunter Water Plan*, as well as time to complete all studies envisaged for the Plan. If studies are completed before the replacement, they should be implemented through periodic amendments to remove community uncertainty.

3.3 Recommendations

Table 8 provides the Commission's overall recommendations on Plan extension and replacement.

Table 8: Recommendations for DPIE-Water

Recommendation	
	The Plan should be:
	a) extended for a further two years until 30 June 2022, with priority actions and amendments progressed in the interim, including to provisions for LTAAELs, AWDs, cease to pump and environmental flow rules, and high flow licence conversions
1	b) replaced by 1 July 2022 supported by the completion of planned or underway foundational studies, monitoring and assessments, as well as new actions recommended in this review. The replacement process should ensure the Plan is aligned with other Greater Hunter plans to ensure consistency of objectives and integration of provisions that should be managed across plans.

¹²⁶ Hunter Water Corporation (n.d.) *Planning for the future*. Available at: <https://www.hunterwater.com.au/our-water/water-supply/water-in-the-lower-hunter/planning-for-the-future>.

4 Provisions related to the volume of water that can be extracted

Under the Act's water management principles, water sharing must prioritise the protection of water sources, floodplains and their dependent ecosystems and contribute to the general principle of restoring these ecosystems.¹²⁷

The most fundamental role of a water sharing plan is to specify the amount of water available for the environment and what can be taken by licenced users and under basic rights. To do this, the Plan establishes water availability limits through LTAAELs.

Establishing limits to the availability of water is particularly important for this Plan, as water entitlements across the Hunter Valley have reached their full allocations given the risk to economic, environmental and social values. Risks to water supply across the Hunter Valley under the current level of water entitlements were assessed as part of the *Greater Hunter Regional Water Strategy* and significant future risks to water security were identified.¹²⁸

Drought security was identified as the primary economic risk facing the Hunter Valley, including to the urban supply, agriculture, mining and power generation sectors. A repeat of the worst drought on record (which occurred between 1936 and 1948) would see general security water allocations in the regulated river reduced to zero for approximately 12 consecutive years.¹²⁹ Analysis of the variability of climate indicates that an equivalent drought may occur on average 1 in 40 years.¹³⁰

The Plan does not set clear numeric LTAAELs (**Section 4.1**) and does not include the full range of water taken in LTAAELs (**Section 4.1**). The lack of robust water accounting has the potential to exacerbate identified risks to the environment, regional industries and NSW Government investment. There are also provisions to increase LTAAELs through issuing of additional water licence entitlements, which are inappropriate given the risks surrounding current allocations.

4.1 Numeric LTAAELs should be established

The Plan establishes LTAAELs for three extraction management units; Greater Hunter, Hunter Regulated Alluvial and Lake Macquarie. A separate LTAAEL is also established for Hunter Water. Apart from the Hunter Water LTAAEL, Plan LTAAELs were established in words – 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.

The primary reason for using words rather than a numeric volume was that, when the Plan commenced, not all water access licences had volumes attached. This issue has been addressed but the Plan has not been amended to include numeric values.

As the LTAAELs do not currently specify an annual volume or include all water take, the amount of planned environmental water is not clear, and the adequacy of this planned environmental water cannot be assessed.

¹²⁷ As per the water management principles, Section 5(3a) of the *NSW Water Management Act 2000*.

¹²⁸ 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.

¹²⁹ *Ibid.*

¹³⁰ *Ibid.*

Establishing numeric LTAAELs that are updated regularly is important to:

- inform water management to manage risks associated with current entitlement levels and potential growth in use
- allow compliance with limits to be monitored and to support the use of AWDs to address any exceedances in extraction (see **Section 5.1.1**)
- ensure environmental water volumes are protected and determine compliance with the protection of planned environmental water volumes
- provide transparency to stakeholders
- underpin an effective water market and ensure water is valued as a limited resource
- support measures to manage impacts of extraction and development on connectivity between water sources.

This issue was previously raised in the 2014 draft implementation audit of the Plan, which recommended establishing a clear numerical statement of the LTAAELs.¹³¹ As this has not yet occurred, this should be undertaken as a priority amendment to the Plan, and not wait until the replacement Plan.

4.2 LTAAELs should include all water taken from water sources

Currently, the LTAAEL definition does not account for several significant sources of water use, which should be included when establishing numeric LTAAELs.

The LTAAEL does not account for dams that are exempted from licences under harvestable rights. In addition, harvestable rights do not include dams 'solely for the capture, containment and recirculation of drainage and/or effluent, consistent with best management practice or required by a Government agency or Local Government Council to prevent the contamination of a water source'.¹³² Mining operations come under this exemption for the containment of contaminated water. The *Greater Hunter Regional Strategy* estimates runoff capture by harvestable rights-exempt mining dams in the Hunter Regulated River catchment area as 45,494 ML per year in above-average median rainfall year, and 11,355 ML per year in the driest recorded rainfall year.¹³³

The strategy notes that this impacts on the equity of harvestable rights, as well as the functioning of the water market (see **Section 6.1.2** and **Chapter 7**) and drought security (see **Section 2.5**). Stakeholders also considered that the exemptions have a detrimental impact on the basic landholder rights of other water users (see **Section 6.1.2**).

¹³¹ NSW Office of Water (2014) *Draft Audit of implementation – Hunter unregulated and alluvial water sharing plan audit report card*. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0008/548027/wsp_audit_report_unregulated_rivers_july_09_june_12.pdf.

¹³² NSW Government (2006) *NSW Government Gazette 40 – 31 March 2006*, pp. 1,628-1,631. Available at: https://gazette.legislation.nsw.gov.au/so/download.w3p?id=Gaz_Gazette%20Split%202006_2006-40.pdf.

¹³³ NSW Department of Industry (2018) *Greater Hunter Regional Water Strategy*, p. 20. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0008/196055/greater-hunter-regional-water-strategy.pdf.

Although not stated in the Plan, the Hunter Water LTAAEL excludes its major diversion from Williams River at Seaham Weir¹³⁴ to Grahamstown Dam via the Balickera Pump Station.¹³⁵ This exclusion is designed to avoid double counting of the extraction at Seaham Weir, as water taken from Grahamstown Dam is counted again when taken under the major utility access licence for the Newcastle Water Source. While this removes the double counting it does not fully account for the extractions from the Williams River as it excludes water lost through evaporation from Grahamstown Dam and rainfall and runoff captured by the dam. The Commission was advised by Hunter Water that this is in the order of 30,000 ML per year on average.¹³⁶ However, the *Lower Hunter Plan* indicates that in a hot, dry summer, this can increase Grahamstown Dam can lose as much water by evaporation as it supplies to customers (about 200 million litres per day).¹³⁷ As such, this is a significant amount of water that should be accounted for in the LTAAEL.

While establishing numeric LTAAELs, it is also recommended that the Hunter Water entitlement is reviewed. For most coastal unregulated and alluvial water sources the level of entitlement is equal to the LTAAEL, as there has never been a requirement to reduce allocations to a sustainable limit that is less than entitlement. However, the entitlement volume held by Hunter Water in the Plan area is 339,075 ML per year, which is significantly higher than their LTAAEL of 78,500 ML per year. The Commission notes that if losses from Grahamstown Dam are accounted for consistently (around 30,000 ML per year), this would only increase the Hunter Water LTAAEL to around 108,000 ML per year. As such, the currently entitlement is still significantly higher.

Hunter Water advised that current entitlement levels are intended to allow the filling of dams after drought and that their annual extraction is currently significantly less than their LTAAEL. Available water use data for Hunter Water's major utility access licences confirms this (**Table 9**).

However, for urban water supplies that have relatively consistent water requirements (in the case of Hunter Water) assessing compliance with the entitlement limit based on rolling averages is a more appropriate way to allow for dams to be filled. A principle of only accounting once should apply but with the account debited from the water source where the water is first extracted. As such, DPIE-Water should review Hunter Water's entitlement to bring it closer into alignment with the LTAAEL.

¹³⁴ Seaham Weir operates as a barrier to saltwater travelling further upstream; there are no licenced extractions from the Williams River below Seaham Weir (i.e. it is not a tidal pool source).

¹³⁵ Office of Water (2011) *Hunter Water Corporation Water licences and approvals*

¹³⁶ Personal communication, Hunter Water, 22 April 2019.

¹³⁷ NSW Department of Finance and Service (2014) *Lower Hunter Water Plan*. Available at: <https://hwc-web.s3-ap-southeast-2.amazonaws.com/assets/src/uploads/documents/Plans--Strategies/Lower-Hunter-Water-Plan.pdf>.

Table 9: Hunter Water water use data (ML per year)¹³⁸

Water access licence no. and water source	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Average Annual Extraction 2014-15 to 2018-19
23880 - Newcastle	43,775	41,890	43,315	44,293	43,076	45,298	43,574
23976 - Williams River (Chichester Dam)	30,854	24,651	23,967	23,651	23,560	23,136	23,793
27427 - Paterson/Allyn Rivers	5		1	2		0	1
11332 - Tomago groundwater*	n.d.	2,363	5,442	2,214	2,121	3,054	3,039
11333 - Tomaree groundwater*	n.d.	2,063	2,137	1,764	1,742	1,195	1,780
Total use relative to HWC LTAAEL		70,967	74,861	71,924	70,499	72,683	72,187
27368 - Williams River (Seaham Weir) [^]	28,635	21,153	53,909	28,421	58,281	28,443	

4.3 Entitlements should not be increased through high flow conversions

The Plan currently allows LTAAELs to be varied through the granting, modification, purchase, cancellation and conversion of access licences. For example, Clause 72(d) allows for conversion from a low flow to high flow licence at a ratio of 1:2. This ratio is designed to encourage water users to move to high flow. While this rule may support some localised reductions in ecological stress at low flow, given the risks to environmental, economic and social outcomes under current water entitlements identified in the *Greater Hunter Regional Water Strategy*, entitlements should not be allowed to increase. As such, Clause 72(d) should be removed in an amendment to the Plan.

¹³⁸ NSW Office of Water (2011) *Hunter Water Corporation water licences and approvals*. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0008/547046/utilities_hunter_water_licences_and_approvals_november2011.pdf. **Table notes:** (*) Tomago and Tomaree are groundwater sources in the *Water Sharing Plan for the North Coast Coastal Sands Groundwater Sources 2016*; (^) Diversions from Williams River at Seaham Weir into Grahamstown Dam are not included in the Hunter Water LTAAEL – use of this water is accounted for under the Newcastle water source major utility access licence.

4.4 Recommendations

To ensure sustainable extraction, the Commission makes the following recommendations (Table 10).

Table 10: Recommendations for DPIE-Water

Recommendations	
	To adequately establish and maintain a sustainable limit on the level of water extraction, amend the Plan by the start of the 2021-22 water year to:
2	<ul style="list-style-type: none">a) establish and publish numeric values for LTAAELs that are updated annually and consider all forms of take, including:<ul style="list-style-type: none">i) estimates of current and potential take from harvestable rightsii) capture of rainfall runoff that is exempt from harvestable rights under Environment Protection Licencesiii) actual volumes removed from the Williams River by Hunter Waterb) remove the high flow conversion clause (Clause 72(d)) that increase the LTAAELs by creating additional entitlementsc) reduce the entitlement for Hunter Water to align with its revised LTAAEL and allow Hunter Water's compliance with its LTAAEL to be assessed using a rolling average to account for yearly variations in flow in the Williams River.

5 Provisions related to when water can be extracted

This chapter explores how effectively the provisions of the Plan govern the timing of water extraction across the Plan area. It focuses on two key groups of provisions:

- AWD provisions, which control the amount of water available to be extracted under each category of access licence within a time period, usually a year.¹³⁹
- Cease to pump provisions, which control when water can be extracted based on a trigger such as the flow levels in a water source on any given day.¹⁴⁰

While LTAAELs control the maximum amount of water that can be extracted over an extended period, AWDs control how much water can be extracted by each licensed water user in any given period, often a year. Cease to pump rules control when water can be taken based on the amount of water flowing in each water source on any given day.

5.1 Available water determinations need to be better applied

The Act allows for the use of AWDs to determine how much water each licence holder can extract over a stated timeframe (usually annually), based on the number of share component units attached to their licence. Licensed water users have this volume of water credited to their water accounts, which allows them to take this additional water in accordance with their account balance and licence conditions.¹⁴¹ After the first year, the Plan requires that AWDs be made at the commencement of each water year and, where possible, be equal to 1 megalitre per share component unit for each access licence.

While the Plan includes AWDs provisions, these provisions are not applied consistently for their intended use, which is to ensure compliance with LTAAELs (see **Section 5.1.1**). There are also opportunities to expand the use of AWDs to manage water supplies in drought periods, which will become increasingly important given climate predictions (see **Section 5.1.2**). AWDs should also be aligned across connected water sources in other Hunter Valley water sharing plans to avoid unintended equity issues (see **Section 5.1.3**).

5.1.1 Available water determinations should be used to ensure LTAAEL compliance

AWDs are currently intended to be used to ensure compliance with LTAAELs. If water use exceeds the LTAAEL, AWDs can be reduced in the subsequent years to retrospectively address this exceedance. However, AWDs are not currently used for this purpose, except for the Hunter Regulated River Alluvial Water Source AWDs, which are aligned with AWDs under the Hunter Regulated Plan.

For all other water sources, AWDs have been allocated at 100 percent per year.¹⁴² DPIE-Water produces allocation statements outlining the rationale for their allocations. This process appears largely administrative and is not based on clear analysis. The Commission considers this is

¹³⁹ Part 1, Division 2 of the Plan.

¹⁴⁰ Part 3 of the Plan.

¹⁴¹ Water NSW (2020) *Available water determinations*. Available at: <https://www.industry.nsw.gov.au/water/allocations-availability/allocations/determinations>.

¹⁴² NSW Department of Industry (2019) *Available Water Determination Order for Various NSW Unregulated and Alluvial Water Sources (No. 2) 2019*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/234427/Water-order-Variou-NSW-Unregulated-and-Alluvial-Water-Sources-No.-2-190701.pdf.

reflective of broader issues around the lack of numerical LTAAELs to set clear limits on the total pool of water to be allocated through the AWD process. It also reflects as a lack of water usage data for unregulated users outside of major utilities (although new metering reforms are likely to address this to some extent, see **Section 8.4**). Addressing these issues will allow AWDs to be used more effectively as a compliance tool and they should be implemented as such in the replacement Plan.

5.1.2 Available water determinations should also control water supply in drought

AWDs allow water managers to adjust the amount of water available without needing to change the level of entitlement. This makes them a good tool to manage water supply during drought, which will be increasingly important given future climate predictions. AWDs are currently used for this purpose in Hunter Regulated Alluvial Water Source (managed under the Plan), regulated river plans and larger inland groundwater plans.

In all other water sources in the Plan, AWDs are currently only used to achieve compliance with LTAAELs in the Plan area, and are only used to adjust below 1 ML per unit share of access licence share component if the LTAAEL has been exceeded.¹⁴³ This limits the ability to use AWDs to proactively reduce water allocations during extreme climate events such as drought. In addition, given the LTAAEL is the sum of all entitlements, it is unlikely that AWDs less than 100 percent would be triggered under the current Plan.

Other provisions of the Plan, while not designed specifically to manage climate variability, may already partially fulfil this function but have limitations. For example, 'no visible flow' cease to pump rules restrict extraction and protect pools when flows stop. However, these rules do not encourage rationing of water, with stakeholders reporting incidences of potentially unsustainable extraction prior to rules being implemented.¹⁴⁴ This may also cause equity issues between water users, whereby upstream extractors are less affected by cease to pump rules than those downstream. The Plan includes an objective to 'manage these water sources to ensure equitable sharing between users'.¹⁴⁵ Reducing allocations through AWDs would allow proactive rationing of extraction and share the reduction in water more equitably across water users, regardless of their relative position in each water source.

The Minister currently has the ability, under Section 324 of the Act for unregulated rivers, to implement temporary water restrictions to cope with water shortages. While this is one option to manage water during periods of drought, having AWD rules within the Plan itself to address this issue should be considered in the replacement Plan.

5.1.3 Available water determinations should align across connected plans to ensure equity

The Greater Hunter has multiple LTAAELs and associated AWDs for the regulated, unregulated and alluvial systems spread across different – but connected – water sharing plans (see **Section 3.2**). A lack of alignment of these different AWDs creates potential issues for equitable water access, particularly during times of drought.

For example, AWDs are used more actively in the Hunter Regulated Plan compared to the unregulated Plan. In the Hunter Regulated Plan, AWDs for general security and high security licence holders in the Hunter River are adjusted based on water availability in dams and

¹⁴³ Clause 47 of the Plan.

¹⁴⁴ Submission: Individual, received 13 September 2019.

¹⁴⁵ Part 1, Clause 10 of the Plan.

predicted inflows. While this is good water management practice, the relatively limited use of AWDs for this purpose in the unregulated Plan has the potential to create unintended inequity between users.

For example, during droughts, general security users under the Hunter Regulated Plan may have their AWDs significantly reduced or set to zero. However, water from the regulated Hunter River ultimately flows into the unregulated tidal pool water sources of the Plan, where licensed extractors have historically been allocated AWDs of 100 percent, regardless of river conditions. As such, one group of users has significant restrictions placed on their extraction volumes, while others are unrestricted despite water being connected.

To address this issue, the linkages between AWDs in connected water sources across water sharing plans in the Hunter should be considered as part of the broader alignment of Greater Hunter water sharing plans (as recommended in **Section 3.2**).

In another example, the AWD for the Hunter Regulated River Alluvial Water Source¹⁴⁶ (under the unregulated Plan) has been the same as the AWD for high security licence holders under the Hunter Regulated Plan. This is good practice given the evidence that these water sources are highly connected. However, the Plan includes an amendment clause to allow the AWD to be the same as Hunter Regulated Plan general security access licences, unregulated alluvial access licences, or the sum of specified percentages of the AWD made for regulated river general access licences and unrequired aquifer access licences.¹⁴⁷ In effect, this may remove the requirements for the AWDs to be connected for regulated river licence holders (either general or high security) and regulated river alluvial licence holders.

This clause should be removed in the replacement Plan to ensure an ongoing linkage between the AWD for regulated river licence holders (either general or high security) and regulated river alluvial licence holders. Whether regulated river alluvial AWDs should be linked to general or high security regulated river AWDs has not been assessed as part of this review and will need to be considered by DPIE-Water.

5.2 Environmental flow rules need revision

Environmental flow rules are designed to provide water for the environment across a range of flow events from floods to very low flows.¹⁴⁸ Environmental flow rules are normally in the form of cease to pump rules. In riverine water sources, cease to pump rules require licence holders to stop pumping when the river falls below a specified level to protect a portion of the flow regime, particularly refuge pools and to maintain longitudinal connectivity. Commence to pump rules delay a licensee's ability to pump water to allow the river to recover slightly after periods of low or no flow. In tidal pool water sources, where water levels are based on tides, cease to pump rules are based on salinity levels instead of river level.

Sometimes different users are assigned different cease to pump levels. This creates flow classes, which are as follows:

¹⁴⁶ The Hunter Regulated River Alluvial Water Source is part of the *Hunter Unregulated and Alluvial Water Sharing Plan*, extending from the top of the high bank of the Hunter Regulated River or Glennies Creek to the boundary of the alluvial aquifer covering the unconsolidated alluvial sediments, excluding the alluvial sediments covered by the Hunter Regulated Plan.

¹⁴⁷ Clause 52(4) of the Plan.

¹⁴⁸ DPIE-Water (n.d.) *Overview of environmental flows*. Available at: <https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/environmental-rules/overview>.

- **No flow classes or cease to pump rules established**
- **Very low flow class** – these protect planned environmental water and higher priority users such as urban water supplies, and do not allow most other users to pump.
- **A Class** – if established, these are generally normal access licences.
- **B Class or High flow** – if established, these are generally for large users or where the A Class cannot accommodate the daily pumping requirements of all users.

Where more complex or priority values need to be protected (for example high ecological value water sources), environmental flow rules should address these other requirements in addition to cease to pump rules.

When the Plan was developed, the understanding of the environmental water needs was limited. The Plan intended to undertake studies to refine cease to pump rules, but most studies did not occur, and the Plan remains largely as it was at commencement. This creates risks for high ecological value water sources (**Section 5.2.1**) and users in other water sources (**Section 5.2.2**). In addition, variation in cease to pump rules has created confusion and perceptions of inequity in water share (**Section 5.2.3**).

Environmental flow rules for Hunter Water to protect the Hunter Estuary have been developed but not implemented (**Section 5.2.4**), while rules for tidal pools are still outstanding (**Section 5.2.5**). Further, the Plan allows for cease to pump exceptions for certain users, without clearly specifying mitigation measures to account for this additional take (**Section 5.2.6**).

5.2.1 Environmental flow rules must protect high ecological value water sources

It is essential to identify and protect surface and groundwater systems that contain high instream (ecological) values and protect these values through well-evidenced environmental flow rules based on the specific needs of each water source.

The macro planning approach for water sharing plans for unregulated rivers states that specific rules may be required to protect important instream values, such as the protection of habitat or passage for specific species or groups of species at certain times of the year.

No specific rules to protect high instream values have been established in the Plan.¹⁴⁹ Eleven of the Plan's 36 surface water sources were identified as having high instream value (see **Section 2.7**).¹⁵⁰ Of the water sources with high ecological values, two have no environmental flow rules established and five have rules that are likely to be inadequate. The four remaining water sources¹⁵¹ have cease to pump rules based on flows or water levels only.

¹⁴⁹ NSW Office of Water (2011) *Macro water sharing plans – Approach for unregulated rivers*. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0008/548153/macro_unreg_manual_web.pdf.

¹⁵⁰ Factors used to determine high instream ecological values included 'the presence of threatened fauna and other biota that are likely to be affected by extraction', as well as species diversity, wet flora quality, riparian vegetation, fish community integrity, listed wetlands, world heritage or wilderness values and whether the source is a drought refuge for platypus and other aquatic species. (Department of Water and Energy (2016) *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009 – Background document for amended plan 2016*, p. 12. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166849/hunter-unreg-alluvial-background.pdf).

¹⁵¹ Merriwa River (0.5 ML per day after Year 6), Upper Hunter River (12 ML per day after Year 10), Rouchel Brook (on falling river 2 ML per day October to March and 1 ML per day for April to September – although can be reduced to zero, essentially 'no visible flow') and the Patterson Allyn - Allyn Management Zone (15 ML per day).

The Plan did not initially establish environmental flow rules for the Upper Wollombi Brook (unregulated and alluvial) and Upper Goulburn River (unregulated and alluvial) water sources. It was intended to establish these rules by Year 10 of the Plan following studies to determine flow requirements, but these were not undertaken. The Commission understands these studies were not undertaken due to limited resources.

While studies should be undertaken to ensure rules are adequate, having no rules in the meantime does not align with principles of the Act, which requires that environmental water rules are established for all water sources as soon as practicable.¹⁵² Interim rules should be in place to provide some level of protection for key environmental assets.

Five high ecological value water sources also have 'no visible flow' cease to pump rules, which were implemented either at Plan commencement or at Year 6.¹⁵³ By definition, this rule only protects pools that remain after rivers have ceased to flow. Other elements of the flow regime as set out in the river flow objectives – such as low flows – are not protected.¹⁵⁴ The appropriateness of no visible flow rules to protect high ecological value water sources should be reassessed as part of Plan replacement.

This review also recommends that the ecological values of all water sources be reviewed to identify any other high ecological value sources that may not be classified as such (see **Section 7.1**). If any new water sources with high ecological values are identified, the environmental flow rules for these sources should be reviewed and updated to ensure ecological values are protected.

By the start of the 2021-22 water year, interim cease to pump rules should be established for Upper Wollombi Brook (unregulated and alluvial) and Upper Goulburn River (unregulated and alluvial) water sources. For the replacement Plan in 2022, cease to pump rules should be revised and strengthened across high ecological value water sources to reflect the risks associated with these areas. This should include reassessment (see **Section 7.1**), undertaking relevant studies, and reviewing the effectiveness of 'no visible flow' rules.

In setting the cease to pump rules, consideration needs to be given to the volume of water that can be extracted by high priority activities to ensure there is enough water remaining for the environment. In cases where rules are based on river flow, implementation should be supported through improved measurement of flow and extraction (see **Section 8.4**).

5.2.2 Cease to pump rules should be reviewed for all other water sources

For water sources identified as not having high instream values, cease to pump rules are likely to be adequate to protect values. A total of 29 water sources in the Plan area are not classified as having high instream values. These water sources have no cease to pump rules or have limited protection with 'no visible flow' rules. Although this can be appropriate where there is low ecological risk, cease to pump rules should be designed to ensure there is enough water for the environment as a priority, in line with the priorities under the Act and outlined in the Plan's background document:

¹⁵² Part 1, Division 2, Section 8 of the *Water Management Plan 2000*.

¹⁵³ Upper Hunter River - Stewarts Brook, Glennies Creek (at Plan commencement), Newcastle, Paterson/Allyn Rivers, Upper Paterson and Dora Creek (at Year 6).

¹⁵⁴ WaterNSW (n.d) *River flow objectives*. Available at: <https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/environmental-rules/river-flow-objectives>.

'Extensive research undertaken in Australia on the importance of protecting very low flows indicates that they are very important for maintaining water quality, allowing passage over riffles for fish and other fauna to pools used for drought refuge, and maintaining those parts of aquatic ecosystems that are most productive'.¹⁵⁵

Development of cease to pump rules also needs to consider the volume of water that can be extracted by high priority activities such as basic rights users to ensure there is enough water remaining for the environment.

This review identified several specific issues with cease to pump rules in water sources not identified as having high ecological value, as follows:

- The proportion of water sources with limited rules is high, which can result in cumulative impacts across the region during dry times and is therefore unlikely to adequately protect ecological values across the Hunter Valley.
- For seven water sources and five management zones, the Plan states that cease to pump rules may be established by Year 10.¹⁵⁶ This was because further studies were required to understand connectivity within these sources. Adaptive management actions were identified when the Plan commenced to drive this process, including the installation of groundwater bores, and monitoring to assess groundwater behaviour, extraction impacts and potential impacts on groundwater dependent ecosystems over several years. Cease to pump rules were intended to be developed based on this information and socioeconomic assessment but this has not occurred.¹⁵⁷

DPIE-Water advised that groundwater bores were installed but only one hydrogeological investigation in the Baerami Creek Water Source has been completed to date. The Commission understands that a study has been undertaken for the Isis River but has not been provided with the findings.

Where the Plan states that cease to pump rules may be established after a stated period, the Commission considers that the term 'may' is inappropriate and does not align with the Act, which requires environmental water rules to be established for all water sources as soon as practicable.¹⁵⁸

- The Commission understands that changes to flow management in some streams was considered unlikely to provide significant improvement in outcomes and may be a reason that cease to pump rules were not implemented.¹⁵⁹ The Plan should be amended to specify that all water sources should have a cease to pump rule by the 2022 replacement Plan.

¹⁵⁵ Department of Water and Energy (2016) *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009 – Background document for amended plan 2016*, p. 12. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166849/hunter-unreg-alluvial-background.pdf.

¹⁵⁶ Halls Creek (unregulated & alluvial), Baerami Creek (unregulated & alluvial), Widden Brook, Bylong Creek, Wollar Creek, Lower Goulburn, Martindale Creek, Pages River - Segenhoe Management Zone - Alluvial, Dart Brook - Lower Dart Brook Management Zone (unregulated and alluvial), Lower Middle Brook (unregulated and alluvial), Kingdom Ponds (unregulated and alluvial) and Jerrys - Appletree Flat Management Zone (unregulated and alluvial).

¹⁵⁷ 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.

¹⁵⁸ Part 1, Division 2, Section 8 of the *Water Management Plan 2000*.

¹⁵⁹ For example, the Goulburn and Bylong Rivers; Widden, Wollombi and Dart Brooks; Baerami, Doyles and Martindale Creeks; and the lower Pages River have been highly modified due to land use history in the catchment. As a result these streams have a lack of flow reliability and drought refuge pools, reduced instream habitat and water quality, and poor condition of some aquatic ecosystems (Department of Water and

- Two water sources and six management zones have ‘no visible flow’ cease to pump rules that were implemented at Plan commencement¹⁶⁰ and, in Year 6, in 11 water sources and one management zone had these rules implemented.¹⁶¹
- In 19 water sources, alluvial access licences have no cease to pump rule if their supply work is located more than 40 metres from the top of the high bank of the river.¹⁶² Existing users have no cease to pump rules and receive 100 percent AWD, effectively meaning that access licences in these water sources are only restricted by an annual limit. These areas are protected from over extraction by restrictions and converting between alluvial and surface water access licences (see **Section 7.3**).

The appropriateness of these rules should be reviewed, with consideration of the connectivity between surface and groundwater. In instances where surface and groundwater are connected, these water sources should be managed as single water source and protected through the same cease to pump rules, not through restrictions on conversions. If cease to pump rules are implemented, the appropriateness of current trade restrictions into these water sources could also be reviewed to increase trade flexibility (see **Section 7.2**).

By not undertaking studies to assist with setting appropriate cease to pump rules, environmental outcomes related to maintaining water quality, fish passage or productive aquatic ecosystems are likely not being realised. These risks are further exacerbated by high hydrologic stress and high surface to groundwater connectivity in these water sources. Necessary studies and appropriate cease to pump rules should be developed and implemented as a priority amendment.

The Hunter Regulated River Alluvial Water Source does not have a cease to pump rule but under the current default rule this water would cease to pump once the AWD reaches zero (see **Section 5.1.3**). This is considered appropriate as the alluvial groundwater source is recharged from the regulated river. Cease to pump rules for the tidal pool water sources have specific issues and are discussed in more detail in **Section 5.2.6**.

Changes to water sharing provisions may have social and economic implications – both positive and negative – for different stakeholder groups. Protecting environmental values is the key priority across water sources, especially in those with high instream or ecological values. However, socioeconomic impacts should also be considered, for example one stakeholder submission described that:

‘We are extremely fearful that the outcome of the review will be an increase in the cease to pump limit. If this occurs, the viability of farming businesses will be seriously threatened, which will

Energy (2016) *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009 – Background document for amended plan 2016*. Available at:

https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166849/hunter-unreg-alluvial-background.pdf.

¹⁶⁰ Isis River (regulated) and Glennies water sources, and Wybong Creek – Dart Brook – Upper Dart Brook, Upper Middle Brook, Pages River – Murrurrundi, Scotts Creek, Kewell Creek and Gundy management zones.

¹⁶¹ Munmurra River (unregulated & alluvial), Krui River (unregulated & alluvial), Bow River (unregulated & alluvial), Singleton (unregulated) and Glendon Brook (unregulated) water sources. Dart Brook – Petwyn Vale, Muswellbrook, Jerrys- Jerrys, Luskintyre, Singleton, Black Creek and Wallis Creek management zones.

¹⁶² Wallis Creek, Isis River, Upper Hunter River, Rouchel Brook, Muswellbrook, Jerrys Management Zone of the Jerrys, Glennies, Glendon Brook, Luskintyre, Singleton, Black Creek, Wallis Creek, Newcastle, Paterson/Allyn Rivers, Williams River, Upper Paterson, North Lake Macquarie, South Lake Macquarie and Dora Creek water sources.

have social implications for local communities. In these challenging economic times, any measures that reduce the productivity of businesses will have a flow on effect to other areas'.¹⁶³

These socioeconomic impacts need to be considered in the development of cease to pump provisions to ensure potential impacts are understood and perverse outcomes are minimised where possible, while maintaining environmental outcomes in line with the Act. The Commission recommends that these issues are addressed and cease to pump rules in all water sources are properly assessed as part of the replacement Plan.

The Commission also recommends the reassessment of economic dependence in these water sources to better capture current and future industry needs (see **Section 7.1.2**). Any new classifications will need to be considered when developing cease to pump rules for water sources with identified economic dependence.

5.2.3 Cease to pump rules should be risk-based, consistent and clearly communicated

There is considerable variation in cease to pump rules in the Plan's water sources. Some water sources have no established cease to pump rules, while others have rules based on visible flows, specific flows or water levels. In some cases, cease to pump rules were supposed to be implemented during the Plan period based on further studies and data but this has not occurred.

While there should be variation in cease to pump rules given the range of ecological values, river condition and industries in the region, a consistent, risk-based approach should be used when developing cease to pump rules. This should ensure that water sources with similar risks have the same cease to pump rules.

A consistent risk-based approach also helps to clearly communicate the process and ensure equity between licence holders – to avoid stakeholder confusion and mistrust. Stakeholder feedback indicates that the current variation in cease to pump rules has created confusion and perceptions of inequity in water share within and between licence classes, which potentially creates mistrust amongst water users. Although self-regulation is generally considered effective and supported by key water user groups,¹⁶⁴ stakeholder submissions also described examples of where it provides opportunities for inequitable water take and disagreement:

'[The] Plan lacks certainty as there is no conditions regarding cease to pump during low flows. During dry times it leads to disharmony in the community, as different people have different views on when to cease to pump'.¹⁶⁵

'The Wybong Water Users as a body put in place self-imposed restrictions in times when the Wybong creek is in stress ... Not all license holders abide by the rules, socially this pits neighbour against neighbour. To overcome this, we feel consideration be given in the water sharing plan that the local bodies' self-imposed rules are enforceable'.¹⁶⁶

¹⁶³ Submission: Individual submission, received 13 September 2019.

¹⁶⁴ Submissions: Lower Hunter Water Users Association, received 10 September 2019; Wybong Water Users Association, received 16 September 2019; Baerami Creek Water Users Association, 8 November 2019.

¹⁶⁵ Submissions: Individual, received 25 October 2019; Wybong Water Users Association, received 16 September 2019.

¹⁶⁶ Submissions: Individual, received 25 October 2019; Wybong Water Users Association, received 16 September 2019.

Irrigator groups generally felt that self-imposed rules were effective because they are based on local knowledge¹⁶⁷ (*‘the local landholders understand and appreciate their water resource better than anyone else’*¹⁶⁸). However, inconsistent measurement and enforcement brought about conditions of uncertainty and tension among water users.

In general, improved metering and monitoring infrastructure will not only help improve knowledge and management of the water sources (see **Section 8.3**), but also assists in transparency and enforcement of cease to pump rules to ensure certainty and trust among water users.

The Plan’s rules are more stringent where there is monitoring infrastructure in the water source to enable data collection. If there is no monitoring the cease to pump rule is set as ‘no visible flow’ or not set at all. DPIE-Water should prioritise the installation of monitoring infrastructure in key water sources with high ecological values to enable access rules to be developed based on data in conjunction with identified environmental water needs.

5.2.4 Cease to pump rules should consider time delays in groundwater response to dry periods

In some water sources, the Plan has the same cease to pump rules for connected surface water and groundwater systems, as such cease to pump rules for surface and groundwater come into effect at the same time.¹⁶⁹ While this approach is good practice, it does not recognise that there may be time delays in the response of some groundwater sources to dry conditions compared with surface water sources (where these sources are highly connected). As such, cease to pump rules may be implemented in groundwater sources prematurely in some cases.

If temporal differences exist between surface and groundwater impacts in dry conditions, allowing for time delays for cease to pump rules for groundwater sources could support socioeconomic outcomes, particularly in times of drought. However, understanding of the temporal differences between surface and groundwater systems is currently limited. Any changes to cease to pump rules on this basis must be supported by monitoring and Plan-specific studies.

5.2.5 Planned environmental flow rules for Hunter Water need to be implemented

Hunter Water is the largest entitlement holder and user of water in the Plan, with the Williams River being its primary water source. Given this, its environmental flow rules are critical to the overall health of a range of connected water sources in the Plan area, including the Hunter Estuary. While the Hunter and Paterson regulated rivers have had environmental flow rules for the estuary since 1980s, the unregulated rivers, including the Williams River, have not had environmental flow rules.

The Plan provided for the Minister to amend the surface water rules for the Lower Williams River based on the outcomes of a supplementary study by Hunter Water.¹⁷⁰ This study was undertaken, in addition to several technical investigations in the last 20 years, including studies

¹⁶⁷ Submissions: Baerami Creek Water Users Association, 8 November 2019; Individual, received 18 September 2019.

¹⁶⁸ Submission: Baerami Creek Water Users Association, 8 November 2019.

¹⁶⁹ Part 19 of the Plan.

¹⁷⁰ Clause 19(5) of the Plan.

on macroinvertebrates, habitat, fish migration, stratification and estuary sensitivity. Despite these studies, no amendments have been made to the rules.

In addition, the technical working group of the *Lower Hunter Water Plan* recommended that rules were required in 2014 while the studies were being undertaken, to provide Hunter Water with certainty around allowable extraction for their long-term planning.

Following the implementation of planned studies, an interagency working group provided in principle agreement to revise the operating rules to reflect the findings of the study following required infrastructure works at Chichester Dam and Seaham Weir. A set of rules for Hunter Water known as Scenario 10 were established and endorsed by the NSW Government (**Table 11**).¹⁷¹ However, the new rules have not been reflected in the Plan or implemented. In its submission, Hunter Water stated:

'Despite the fact that the WSP was designed with explicit recognition that these changes may need to be made during the life of the plan (Cl 85 (2)), the changes have not yet been made in the WSP, and therefore remain disallowed in practice. At this point in time, therefore, the structure of the WSP, or possibly the process for amending it, is hampering the implementation of changes that will improve environmental outcomes'.¹⁷²

Correspondence from the former DPI-Water to Hunter Water in November 2013 provided notice that it intended to amend the Plan to implement the agreed environmental releases at Chichester Dam and Seaham Weir, subject to further negotiations and infrastructure modifications. Hunter Water advised that the infrastructure modifications to deliver improved environmental flows from Chichester Dam have been undertaken.

However, DPIE-Water has advised that some remaining works at Seaham Weir (construction of a fishway) are outstanding. DPIE-Water also advised that Williams River irrigators will need to be consulted to ensure the new environmental flows from Chichester Dam and accompanying access rules will result in comparable access conditions to the 2009 water sharing plan rules.

The Plan should be amended to include interim environmental flow rules for Hunter Water, based to the best extent possible on established flow rules. The Plan should also be amended to include a provision that the NSW Government-endorsed rules should be fully implemented in the replacement Plan or once Seaham Weir is modified, whichever occurs first.

¹⁷¹ NSW DPI (2014) *Development of Water Sharing Rules for Seaham Weir and Chichester Dam* (unpublished).

¹⁷² Submission: Hunter Water, 23 October 2019.

Table 11: Water sharing rules for Hunter Water

Chichester Dam	<ul style="list-style-type: none"> ▪ Transparent release 20 ML per day when no water restrictions apply ▪ Transparent release 14 ML per day when moderate restriction (level 1 and 2) ▪ Transparent release 7 ML per day when severe restrictions (level 3 and 4) apply
Seaham Weir	<ul style="list-style-type: none"> ▪ 30 percent translucency release when no water restrictions apply ▪ 20 percent translucent release when moderate restrictions (level 1 and 2) apply ▪ 10 percent translucent release when severe restrictions (level 3 and 4) apply ▪ 20 ML per day transparency at Seaham Weir ▪ 500 ML fresh once per year

5.2.6 Tidal pool rules should be established

The Plan contains three tidal pool water sources in the Hunter Estuary - the Wallis Creek, Paterson River and the Hunter River tidal pools. Tidal pools are important ecologically as they provide permanent habitat, nursery grounds for migratory fish and waiting areas until high tide for species accidentally caught in the river system.

The Plan defines tidal pools as the area of water between the upper mangrove limit and the lower tidal limits. In practice, these are the freshwater areas at the top of an estuary that is impacted by both freshwater from rivers and tides that bring saltwater up the river, and where extraction of fresh water by irrigators occurs.

Tidal pools are unique because the amount of water remains the same but the salinity of the water changes depending on the amount of freshwater inflow. Tidal pool stakeholders raised concerns around poor environmental outcomes in the tidal pools in spring and summer, with one submission noting that *'electrical conductivity rises from 800 microsiemens/centremetre to over 4,000 when end of system flows from the Hunter Regulated system cease'*.¹⁷³

The unregulated Williams River, together with the regulated Hunter and Paterson Rivers have environmental flow rules to pass water into the estuary for the benefit of key environmental assets, including the Ramsar-listed wetlands (which are outside of the Plan area but dependent on water from these plans). However, there are currently no rules to ensure that this water is used for the benefit of the environment, as well as water users, once it reaches the estuary.

Clause 87 of the Plan states the Minister may amend this Plan to establish or modify flow classes, establish or modify a flow reference point, or amend access licence dealing rules, in the Wallis Creek Tidal Pool Water Source, the Paterson River Tidal Pool Water Source and the Hunter River Tidal Pool Water Source, following the review.

The Plan provided for salinity monitoring of the Hunter Estuary and the development of environmental flow rules for the four tidal pool water sources. Salinity probes were installed

¹⁷³ Submission: Individual, received 17 September 2019.

in October 2009 at Dunmore and Hinton Bridge on the Patterson River and MacKimms Corner, Green Rocks, Raymond Terrace, Hexham and Fullerton Cove on the Hunter River.¹⁷⁴

These data have been used to inform the whole-of-government hydrodynamic estuary models developed by the Hunter Valley Hydrodynamic Platform and Model(s) Project.¹⁷⁵ This project assessed how salinity in the estuary would behave under different water sharing rules and during droughts. These models informed the infrastructure options for the *Greater Hunter Regional Water Strategy* and should be used to develop tidal pool rules in the replacement Plan. These rules should align with any adjustments required for infrastructure developed under the *Greater Hunter Regional Water Strategy*, as well as other water sharing plans in the Greater Hunter.

The model should help to better accommodate the seasonality issues noted in tidal pool sources. It will also be important that the rules apply to both cease to pump and AWDs, particularly to address the equity issues around reductions in water availability in drought.

5.2.7 Mitigation for cease to pump exemptions should account for all water taken

In 2013, a Ministerial Order set out 121 amendments to the Plan.^{176,177} A key change was to allow under Clause 19(8) exemptions from cease to pump rules for all water taken under an aquifer access licence under certain conditions, notably for the purposes of a development approved

¹⁷⁴ NSW OEH (2014) *NSW estuary and river water quality annual summary, 2013-2014*. Available at: <http://mhl.nsw.gov.au/docs/oeh/2014/MHL2295%20OEH%20water%20quality%20annual%20summary%202013-2014%20final.pdf>; and Water NSW (2020) *Real time data - state overview*. Available at: <https://realtimedata.watarnsw.com.au/>.

¹⁷⁵ University of NSW (n.d.) *Water Research Laboratory – Hunter Scoping Study*. Available at: <http://www.wrl.unsw.edu.au/sites/wrl/files/uploads/PDF/Hunter-Scoping-Study.pdf>.

¹⁷⁶ *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources, Amendment Order*, 22 February 2013.

¹⁷⁷ Under s 45(1)(a) of the Act, the Minister for Primary Industries made an order to amend the Plan on 22 February 2012, which came into effect on 8 March 2013.

under Part 3A¹⁷⁸ and 4¹⁷⁹ (if deemed a State Significant Development¹⁸⁰ or Infrastructure¹⁸¹) or Part 5.1¹⁸² of the *Environmental Planning and Assessment Act 1979*.

These amendments were applied under the Order in 2015 (Year 6 of the Plan). As a result, some extractive users in the Plan area, such as mining operations, can take water from alluvial aquifers in periods of very low flow. This water is intended to protect basic rights access to water and refuge for fish and threatened species during drought.

The NSW Minerals Council and mining operators in the Plan area¹⁸³ consider that the exemptions are necessary for their operations as incidental take from mining operations cannot be controlled in the same way as when extracting water through a pump. Incidental take occurs where open-cut mine voids intercept and depressurise the deep groundwater systems where coal is found and, depending on connectivity, may dewater the alluvium and take water from surface water systems:¹⁸⁴

'Incidental takes resulting from mining operations cannot be readily controlled like traditional water extraction through a pump. The Hunter Unregulated WSP recognises this fact through provisions (e.g. clauses 9 and 68) that exempt approved aquifer interference activities such as mining from 'cease to pump' provisions given they cannot practically comply with them, provided certain conditions are met'.¹⁸⁵

Mining operators consider that an inability to control the take means that the exemption is a 'common-sense provision'¹⁸⁶ that should be continued under any new or extended Plan. The

¹⁷⁸ In 2011, the NSW Government repealed Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and announced that it will no longer accept any new projects in the Part 3A assessment system. This system has been replaced by the State Significant Development and State Significant Infrastructure assessment systems, which commenced on 1 October 2011.

¹⁷⁹ As part of the above changes to the planning assessment system, Part 4 developments requiring development consent under Part 4, include complying development (development that complies with pre-determined development standards and requires consent in the form of a complying development certificate by a consent authority or accredited certifier); development that requires consent by a council or other public authority specified as the consent authority (including by a local planning panel or delegated council staff on behalf of a council); regionally significant development (development that requires consent by a Sydney district or regional planning panel); State significant development (development that requires consent by the Independent Planning Commission or the Minister); designated development (development, other than State significant development, that requires an environmental impact statement for an application for consent); and integrated development (development that also requires approvals under other legislation that are integrated under general terms of approval).

¹⁸⁰ The NSW Government identified certain types of development that are state significant development, for example new educational establishments, hospitals and correctional centres; chemical and other manufacturing; mining and extraction operations; tourist and recreation facilities; some port facilities; waste management facilities; energy generating facilities (NSW DPIE (2019) *State significant developments*. Available at: <https://www.planning.nsw.gov.au/Assess-and-Regulate/Development-Assessment/Planning-Approval-Pathways/State-Significant-Development>).

¹⁸¹ The NSW Government identified certain types of development that are state significant infrastructure, for example: rail infrastructure; road infrastructure; water storage and treatment plants; wharf and boating facilities; pipelines; certain developments in national parks (NSW DPIE (2019) *State significant developments*. Available at: <https://www.planning.nsw.gov.au/Assess-and-Regulate/Development-Assessment/Planning-Approval-Pathways/State-Significant-Development>).

¹⁸² Division 5.1 sets out environmental impact assessment requirements (except for State Significant Infrastructure).

¹⁸³ Submissions: NSW Minerals Council, received 24 October 2019; Mt Owen Pty Ltd, received 16 September 2019; Peabody Energy Australia Pty Ltd, received 16 September 2019; YanCoal, received 16 October 2019.

¹⁸⁴ Department of Planning (2005) *Coal mine potential in the Upper Hunter Valley – Strategic Assessment*. Available at: <https://trove.nla.gov.au/work/32319537?q&versionId=39276100>.

¹⁸⁵ Submission: NSW Minerals Council, received 24 October 2019.

¹⁸⁶ Submission: NSW Minerals Council, received 24 October 2019.

Commission notes the concerns of mining operators regarding their ability to meet any cease to pump rules. However, by allowing these circumstances to be managed by a process independent of the Plan, the exemption removes the certainty that Plan provisions can achieve its outcomes. Some stakeholder submissions raised these concerns regarding the exemption:

'A number of exemptions to rules in the WSP provided to the mining industry eg cease-to-pump in alluvial water sources, causes increased pressure on the health of the system and causes unfair water sharing with other users'.¹⁸⁷

It is not clear how much water is currently extracted under this exemption. DPIE-Water advised that the access licences do not feature the exemption, but it is assumed that the exemption applies to the access licences in surface water sources that are held by mining companies. The number of licences and the total volume is unknown.

Although not known, the volume of water exempted under this clause could be significant. Regional hydrological impacts of existing coal mining operations¹⁸⁸ in the Hunter Valley have been estimated to result in potential groundwater drawdown over 1,830 square kilometres. Possible expansions of coal mining operations could increase the drawdown impact to 2,441 square kilometres,¹⁸⁹ with the potential for large changes in flow regimes in Wyong River, Loders Creek, Saddlers Creek, Wollar Creek and several ephemeral creeks.¹⁹⁰

Further, the exemption does not explicitly prescribe the level of mitigation required which has the potential to impact on Plan outcomes. There are also no clear requirements to fully account for take under this exemption. DPIE-Water advised that Section 60I of the Act specifies the requirement for an access licence to account for water taken as the result of an aquifer interference activity, so regardless of the conditions of the planning approval, the mines are legally obliged to account for any take of water from a water source.

It also does not appear that mitigation for water taken under this exemption is returned to the river at the appropriate time to achieve environmental outcomes. DPIE-Water advised that water is not physically returned to the surface water sources. The take is accounted for by the retired (i.e. sleeper) access licences in the surface water sources. However, this form of accounting is only annual, while the exemption is related to cease to pump rules, which operate daily to protect environmental values. In the replacement Plan, this take should be accounted for both annually and daily.

DPIE-Water advised that to determine the number of licences and the associated volumes, and to check if the volumes adequately compensate for the surface water take, a project would need to be scoped and resourced, as it would require significant assessment. It could be requested as a compliance audit or audits in relation to the relevant conditions of consent. The Commission supports an audit of the implementation of Clause 19(8) to date and considers that the Natural

¹⁸⁷ Submission: Nature Conservation Council, received 25 October 2019.

¹⁸⁸ As at December 2015 there 42 mines (22 open-cut and 20 underground). Note: this includes the Central Coast water sharing plan area (Australian Government (2018) *Bioregional Assessments - Hunter subregion - coal resource development and water resources in the Hunter subregion*). Available at: <https://www.bioregionalassessments.gov.au/factsheets/coal-resource-development-and-water-resources-hunter-subregion>).

¹⁸⁹ Australian Government (2018) *Bioregional Assessments - Hunter subregion*. Available at: <https://www.bioregionalassessments.gov.au/assessments/hunter-subregion>.

¹⁹⁰ Australian Government (2018) *Bioregional Assessments - Hunter subregion - coal resource development and water resources in the Hunter subregion*. Available at: <https://www.bioregionalassessments.gov.au/factsheets/coal-resource-development-and-water-resources-hunter-subregion>.

Resource Access Regulator is the most appropriate body to undertake this. This should occur before development of the replacement Plan.

Following the audit, Clause 19(8) should be redrafted for the replacement Plan to ensure all water is accounted for at all times.

The Commission's findings align with recent determinations by NSW Planning Assessment Commission around the impacts of mining operations on groundwater drawdown, and how this affects other water users and the environment.¹⁹¹ Under a determination for the Wallarah 2 Coal Project on the Central Coast NSW, it was required that all projected loss should be accounted for at all times, rather than as part of annual accounts, and that this take is then fully compensated. In this case, potential loss to the water availability from the aquifer of water supply would be compensated by the applicant by providing 300 ML per year of treated water to the catchment, based on modelled take.¹⁹²

5.3 Recommendations

To improve provisions related to when water can be extracted, the Commission makes the following recommendations (Table 12).

Table 12: Recommendations for DPIE-Water

Recommendations	
3	By the start of the 2021-22 water year, amend the Plan to remove Clause 54(4)(b) to ensure AWDs for the Hunter Regulated River Alluvial Water Source are aligned with those for the <i>Water Sharing Plan for the Regulated Hunter River Water Source 2016</i> .
4	Following stakeholder consultation, the replacement Plan (or, if agreed beforehand, an amendment to the Plan) should: <ul style="list-style-type: none">a) consistently and transparently calculate AWDs each year to ensure compliance with LTAAELsb) align AWDs for users in the unregulated Hunter River, Paterson River and Wallis Creek tidal pool water sources with AWDs for upstream Hunter Regulated Plan usersc) include rules following DPIE-Water's consideration of how AWDs can be used to manage extraction during drought, including under predicted climate change.

¹⁹¹ NSW Independent Planning Commission (2018) *Walarah 2 Coal Project*. Available at: <https://www.ipcn.nsw.gov.au/projects/2017/09/walarah-2-coal-project>.

¹⁹² NSW Independent Planning Commission (2018) *Walarah 2 Coal Project*. Available at: <https://www.ipcn.nsw.gov.au/projects/2017/09/walarah-2-coal-project>.

Recommendations

By the start of the 2021-22 water year, amend the Plan to include interim environmental flow rules for the high ecological value Upper Goulburn and Wollombi water sources (which do not currently have rules) and require environmental flow rules to be established for all water sources in the Plan replacement. For the replacement Plan in 2022, reassess environmental flow rules for all water sources and amend rules if needed. The assessment should:

- a) be evidence-based
- b) examine whether current rules can be more effective and efficient
- c) ensure rules are developed for each water source to reflect the specific risks to each water source, with the rationale behind these risks clearly communicated to stakeholders
- 5 d) review the adequacy of rules for maintaining water quality, fish passage and productive aquatic ecosystems
- e) review the adequacy of rules for high ecological value water sources to meet the reproductive requirements of water dependent threatened species by including, for example, first flush rules to ensure water reaches the end of the water source and seasonal rules to increase cease to pump levels at critical ecological periods
- f) consider connectivity between alluvial and surface water licences and, if high connectivity is identified, ensure cease to pump rules are consistent
- g) consider time delays to the best extent possible in groundwater-river response in connected systems
- h) consider the range of social and economic impacts from changes to rules and mitigate adverse impacts to the extent possible.

6 By the start of the 2021-22 water year, amend the Plan to include the NSW Government-endorsed environmental flow rules for Hunter Water and implement these rules to the best extent possible with the current configuration of Seaham Weir, fully implementing rules once Seaham Weir is modified.

7 Establish tidal pool access rules for the replacement Plan based on the Hunter hydrodynamic estuary models developed by the Hunter Valley Hydrodynamic Platform and Model(s) Project.

By the start of the 2021-22 water year:

- a) the Natural Resource Access Regulator should consider undertaking an audit of approvals to date under Clause 19(8) parts b and c to determine if the clause has been given effect to
- 8 b) DPIE-Water should amend Clause 19(8) parts b and c on planned environmental water, which allow for cease to pump exemptions for aquifer interference activities that are either approved by the *Environment, Planning and Assessment Act 1979* or the Minister, to require 100 percent mitigation of any exemptions
- c) DPIE-Water should account for mitigation annually and daily (the timescale at which cease to pump rules operate).

5.4 Compensation and the purpose of proposed recommendations

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

Specifically, the Act states:

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

The Commission considers that compensation might be payable under Section 87AA in relation to **recommendations 4(b)** and **4(c)** of this report. This is only if the effect of the proposed recommendations is found to constitute a reduction in water allocations for the purposes of the section, and to then trigger an entitlement to compensation.

Recommendation 4(b) aims to align AWDs for water users in the tidal pool water sources with AWDs for upstream Hunter Regulated Plan users (see **Table 12** above).

Recommendation 4(c) aims to include rules in the Plan following DPIE-Water's consideration of how AWDs can be used to manage extraction during drought, including under predicted climate change (see **Table 12** above).

Changing these AWD rules seeks to better manage available water and restore water to the environment, as well as other water users, because of natural reductions in inflows during droughts and possible climate change scenarios. Therefore, the Commission considers these proposed changes to be consistent with Section 43A(3A)(a) of the Act.

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

6 Provisions related to who can access water

The Act provides clear statements on who can access water and the priority of access. Water sharing must first protect the water source and its dependent ecosystems, then protect basic landholder rights.¹⁹³ The Act also specifies that priority is given to those principles in the order in which they are set out.¹⁹⁴

Water access licences are also clearly prioritised under the Act.¹⁹⁵ Local water utility access licences, major utility access licences and domestic and stock access licences have priority over all other access licences, and (high security) access licences have priority over all the remaining access licences. Any other access licences have priority between themselves as prescribed by the regulations.

The Plan includes three objectives to support the prioritisation of water users under the Act:

- protect, preserve, maintain or enhance the Aboriginal, cultural and heritage values of these water sources
- protect basic landholder rights
- manage these water sources to ensure equitable sharing between users (equity relates to the appropriate prioritisation of different licence classes under the Act).¹⁹⁶

The Commission reviewed the Plan's performance against these objectives and any associated performance indicators and found that:

- provisions provide for basic landholder rights, but clarity and assessment of these rights could be improved
- Aboriginal outcomes can be better supported by:
 - identifying and linking Aboriginal values, objectives and indicators
 - improving Aboriginal access to and use of water
 - supporting Aboriginal involvement, capacity and leadership in water
- town water supply requirements need to be prioritised in line with the Act to address immediate and future risks
- several provisions should be redrafted given their impact on equitable water sharing between licence classes.

¹⁹³ *Water Management Act 2000 (NSW)*, Part 1, Division 1, Part 5(3).

¹⁹⁴ *Water Management Act 2000 (NSW)*, Part 1, Division 3, Part 9(1).

¹⁹⁵ *Water Management Act 2000 (NSW)*, Part 2, Division 1, Part 58(1) states that 'For the purposes of this Act, the following priorities are to be observed in relation to access licences: (a) local water utility access licences, major utility access licences and domestic and stock access licences have priority over all other access licences; (b) regulated river (high security) access licences have priority over all other access licences (other than those referred to in paragraph (a)); (c) access licences (other than those referred to in paragraphs (a), (b) and (d)) have priority between themselves as prescribed by the regulations; (d) supplementary water access licences have priority below all other 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'.

¹⁹⁶ Part 2, Clause 10 of the Plan.

6.1 Clarity and assessment of basic landholder rights can be improved

There are three types of basic landholder rights to water in NSW, which are given priority under the Act and do not require water licences:¹⁹⁷

- **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 not subject to water licence rules and may be accessed at any time subject to water availability.

The Plan provides for priority of access for basic landholder rights in the area. The Plan includes a relevant objective to ‘protect basic landholder rights’,¹⁹⁸ with the associated performance indicator ‘the change in the extent to which domestic and stock rights and native title rights requirements have been met’.¹⁹⁹

However, the extent to which this objective has been achieved is difficult to evaluate. The Commission did not receive any data that reports against the objective for basic landholder rights or the associated performance indicator. The performance indicator also excludes harvestable rights. There are currently no requirements to licence, monitor or meter any basic landholder rights which makes it difficult to quantify what impact these extractions are having on water sources or may have with projected increases in population, industry and land use (see **Section 2.8**).

Submissions and consultation undertaken as part of this review suggest that basic landholder rights were largely being met under the Plan²⁰⁰ but drought conditions have limited access to water in some areas.²⁰¹ With limited access to water, some stakeholders raised concerns about basic landholder rights being unrestricted and the limited monitoring data to be able to assess their impact on priority environmental water flows and the equity of water share (see **Sections 6.1.1 and 6.1.2**).

More generally, stakeholder feedback suggests that DPIE-Water could further clarify basic landholder rights in the Plan itself (see **Section 6.1.3**). This clarification should be communicated to stakeholders through associated guidelines and in DPIE-Water’s engagement

¹⁹⁷ *Water Management Act 2000*, Sections 52-55.

¹⁹⁸ Part 2, Clause 10(c) of the Plan.

¹⁹⁹ Part 2, Clause 12(f) of the Plan.

²⁰⁰ Submissions: Williams River Water Users Association, received 17 September 2019; Individual submission, received 27 August 2019.

²⁰¹ Submissions: Individual submission, received 13 September 2019; Upper Hunter and Tributaries Water Users Association submission, received 20 October 2019.

activities (see **Chapter 8**), to reduce misunderstanding and promote responsible practices among water users.²⁰²

6.1.1 Domestic and stock rights have been met but require clear guidelines

The Plan provides for just over 14,750 ML per year for domestic and stock rights.²⁰³ The Plan recognises that domestic and stock rights may increase during the life of the Plan. 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.²⁰⁴ No guidelines have been established to date.

Stakeholder feedback suggests that domestic and stock rights have largely been met over the term of the Plan. However, under the current drought conditions, several stakeholders noted that domestic and stock rights had to be augmented with town water to meet their needs²⁰⁵ or that destocking had occurred (*'we have had to totally destock because of the inability to draw stock water'*²⁰⁶).

In addition, some stakeholders felt that the unrestricted and unmonitored use of domestic and stock rights needed to be reassessed due to impacts on priority environmental water flows and the equity of water share, particularly under drought conditions:

'Consider the possibility of limits to stock and domestic pumping rights. Or better guidance could be given to landholders on sustainable water usage on their properties'.²⁰⁷

'There is insufficient water share for the environment ... the minimum environmental flow level before irrigation is permitted is set too low ... no limits to extractions for domestic and stock water, even at times of severe drought, needs to be changed'.²⁰⁸

The NSW Water Renewal Taskforce and DPIE-Water planned to introduce reasonable use guidelines for stock and domestic consumption.²⁰⁹ This action was also put forward in the draft audit of implementation of the Plan.²¹⁰ It was expected that this process would involve a stakeholder consultation process in 2019.²¹¹ However, the Commission has been informed that the NSW Government may no longer be committed to this process.

²⁰² Submissions: NSW irrigators Council, received 25 October 2019; Congewai Valley Landcare, received 21 October 2019.

²⁰³ Clause 22 of the Plan.

²⁰⁴ Part 5, Clause 22(2) of the Plan.

²⁰⁵ Submissions: Individual, received 13 September 2019; Upper Hunter and Tributaries Water Users Association, received 20 October 2019; Nature Conservation Council, received 25 October 2019.

²⁰⁶ Submission: Individual, received 13 September 2019.

²⁰⁷ Submission: Individual, received 25 October 2019.

²⁰⁸ Submission: Individual, received 16 September 2019.

²⁰⁹ The NSW Government's *NSW non-urban water metering policy* states: "The government will be developing, and consulting on, reasonable use guidelines in 2019 to establish a method for determining reasonable water use for domestic and stock consumption pursuant to basic landholder rights." NSW Government (2018) *NSW non-urban water metering policy*, p.5. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0017/205442/NSW-non-urban-water-metering-policy.pdf.

²¹⁰ NSW Office of Water (2014) *Audit of Implementation: Hunter unregulated and alluvial water sharing plan audit report card - prepared for the period between 1 July 2009 and 30 June 2014* (unpublished).

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.

The Commission recommends that this process is resumed by DPIE-Water so that guidelines are developed and implemented across NSW by the end of 2020, to provide clarification and consistency regarding domestic and stock rights. Once these guidelines are established, DPIE-Water will need to update estimates and modelling in the Plan remake or subsequent updates to reflect these guidelines.

6.1.2 Harvestable rights are provided for but need improved monitoring

Harvestable rights are part of basic landholder rights and do not require a water licence.²¹² Some agricultural and industry stakeholders have consistently requested a review of the harvestable rights provision to clarify allowances and investigate an increase for coastal water users.²¹³ They suggest that this would alleviate some pressures generated from trade restrictions and increase the ability to store and trade water across coastal valleys. They have also requested that opportunities for harvesting water from surplus flows during high flow and flood events are investigated, as well as expanding floodplain harvesting across NSW.²¹⁴

In contrast, other stakeholders expressed concerns about any changes to harvestable rights due to impacts on environmental flows and the lack of detailed monitoring or studies of harvesting and its impacts:

'There is noise about questioning harvestable rights. It's got to be about science and evidence on how this impacts on share'.²¹⁵

Other stakeholder concerns included the capacity of mining operations to harvest large quantities of water based on the size of their land ownership, volume of dams, and exemptions, as described by one stakeholder below:

'Coal mines in the upper Goulburn, based on their total area of land ownership can retain over 1,330 ML/year as part of their harvestable rights in their site water balance independent of actual rainfall'.²¹⁶

The exemptions are of particular concern to stakeholders due to their impacts on overall water share and the basic landholder rights of other water users.

The proposed improvements to metering and monitoring in the Plan area should be used to better assess the impacts of harvestable rights, particularly for those exempted activities, so that actual take is better understood and accounted for. Any expansion of 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 currently in the area (see **Chapter 8**).

²¹² 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.

²¹³ Submission: NSW Irrigators Council, received 25 October 2019.

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

²¹⁵ Interviews: Individual, conducted 6 November 2019; Natural Resources Access Regulator, conducted 22 October 2019.

²¹⁶ Submission: Individual submission, received 25 October 2019.

6.1.3 Native title rights provisions need to be strengthened

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, as part of basic landholder rights.

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/year’, with an associated performance indicator being the ‘extent to which native title requirements have been met’.²¹⁷ The Plan also recognises that the exercise of native title rights may increase over the term of the Plan, although it does not include a clause to allow for the amendment.

At the time of this review, there have been no native title determinations in the Plan area but several active native title claims are in place across large parts of the Plan area (see **Section 2.9**).²¹⁸ In addition, there are likely to be future native title claims and these need to be proactively planned for and accommodated in the Plan.

The replacement Plan should acknowledge the likelihood of native title determinations and include a provision to allow for an amendment – this provision should include a set timeframe in which this amendment should occur following a determination.²¹⁹ The Commission suggests that a timeframe of three months is adopted to undertake initial amendments of the Plan, and enough time to undertake detailed engagement, determine water allocations, and make final amendments to the Plan.²²⁰

It is important that DPIE-Water assume a proactive approach to native title rights. Indigenous Land Use Agreements or other agreements²²¹ should be used wherever possible to prevent issues related to the long timeframes of native title claims, potential compensation claims and extended periods of inaction that often follow final determinations (see **Section 2.9**).

²¹⁷ Part 5, Clause 23 of the Plan; Part 2, Clause 12 of the Plan.

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

²¹⁹ 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 (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 of water is preferable as it helps to clarify what is achievable within the native title rights. However, this does vary with some native title rights to water provided 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 rights due to the lengthy and complex processes involved in estimating 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.

6.2 Aboriginal values, rights and interests should be better supported

Aboriginal water values, rights and interests should be better defined and supported in consultation with Aboriginal stakeholders. It is important that the Plan supports Aboriginal outcomes through provisions that reflect the priorities of the Act, alongside:

- processes that protect and support Aboriginal water values and objectives
- strategies to enable water access and a range of uses
- genuine involvement of Aboriginal peoples in water planning, leadership and management.

6.2.1 Aboriginal values, objectives and indicators should be identified and linked

The Plan recognises that Aboriginal peoples have a spiritual, customary and economic relationship with land and water. The Plan's vision includes statements recognising Aboriginal values in these water sources, as follows:

- (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 people.²²²

The Plan also includes a supporting objective to 'protect, preserve, maintain or enhance the Aboriginal, cultural and heritage values of these water sources' and a performance indicator around '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'.²²³

The Plan provisions acknowledge that work was planned for identifying groundwater dependent culturally significant sites:

'Groundwater-dependent culturally significant sites are currently under investigation and may be identified during the term of this Plan. The full list of potential groundwater-dependent culturally significant sites will be identified in the Aboriginal Water Initiative System (AWIS)'.²²⁴

²²² Part 2, Clause 9 of the Plan.

²²³ Part 2, Clause 10 and 12 of the Plan.

²²⁴ Part 9, Clause 40A of the Plan. Note: the Aboriginal Water Initiative was abandoned in 2017.

In addition, the Plan's background document notes that some limited consultation was undertaken on cultural values²²⁵ and that further research on Aboriginal cultural values may be undertaken over the life of the Plan as part of adaptive management.²²⁶

The Commission has not received any information from DPIE-Water on identified Aboriginal values, reports against the objective or performance indicator, or evidence of groundwater dependent or cultural values mapping undertaken during Plan implementation. The lack of any specified Aboriginal values makes assessment of Aboriginal outcomes difficult, particularly 'the recognition and protection of water values'. One stakeholder considered that the 'failure to implement any recognition of cultural values has threatened social outcomes'.²²⁷ There is a lack of clear links between the vision, objectives, strategies and performance indicators for the Aboriginal outcomes of the Plan.

The Plan needs to better identify and support Aboriginal water values, rights and interests in line with relevant legislation and culturally appropriate approaches. Both state and national water legislation and policy integrate Aboriginal cultural and heritage values and uses of water.²²⁸ However, it is also important that this is implemented in a way that recognises the diverse water values of Aboriginal peoples, both material and intangible.²²⁹ Meaningful access to water for Aboriginal peoples has been precluded by concepts of water tenure and property rights, and the narrow definitions of cultural values and the use of water for 'traditional purposes' only.²³⁰ In the case of water sharing plans, this limitation is reinforced both as part of

²²⁵ The Plan's background document states that 'the consultation sessions provided some insights into Aboriginal cultural values in the Hunter Valley. Aboriginal communities have indicated that water sharing rules should protect natural instream values. Whilst Aboriginal groups acknowledge the rights of commercial water users, they believe that this should not be at the expense of the environment. In their view, the priority for water sharing plans should be to provide for natural flowing rivers with healthy aquatic biodiversity.' (Department of Water and Energy (2016) *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009 – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166849/hunter-unreg-alluvial-background.pdf).

²²⁶ Department of Water and Energy (2016) *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009 – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166849/hunter-unreg-alluvial-background.pdf.

²²⁷ Submission: Nature Conservation Council, received 25 October 2019.

²²⁸ The Act 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'.

²²⁹ Common water-related values of Aboriginal peoples include:

- cultural heritage and evidence of historic occupation and use
- 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
- interconnection of values as part of a broad cultural landscape (not confined only to individual sites)
- economic development and opportunities

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

²³⁰ Marshall, V. (2017) *Overturing Aqua Nullius: Pathways to National Law Reform*. In Levy, R., O'Brien, M., Rice, S., Ridge, P. and Thornton, M. (Eds.) *New directions for law in Australia: essays in contemporary law reform*. Australian National University Press, Acton ACT.

cultural water access licences (see **Section 6.2.2**) and under native title and other land-based rights and agreements based (see **Section 6.1.3**).

Feedback received from Aboriginal stakeholders as part of this review identified key cultural values and challenges in the Plan area, including:²³¹

- **Interdependency of water and cultural rights, values and obligations** – *‘Water is central to the storylines of local Aboriginal people ... waterways are a key food source ... a classroom to learn about culture and responsibility for land and water management’.*²³²
- **Value of groundwater and dependent sites** – as an important and underutilised asset for Aboriginal peoples currently impacted visibly by extraction.
- **Need for water retention and flows** – through maintaining trees, controlled clearing, better land management and limitations to extraction to ensure water flows *‘we need water in the rivers – how that’s achieved and what it’s called is beside the point’.*²³³
- **Importance of cultural landscapes (not just individual, identified sites)** – many cultural sites are identified in the Hunter as part of the legislative requirements of mining operations, however these are part of a wider and connected cultural landscape that is often poorly understood and inaccessible to Aboriginal people.

Stakeholders also identified specific challenges to supporting Aboriginal values, rights and interests in water in the Plan area, including:

- **Inclusion of Aboriginal people has been limited** – there is a general lack of awareness and use of water rights due to a long history of limited land ownership and water access in coastal areas and the lack of engagement of Aboriginal people in water planning and management – *‘There hasn’t been a serious point of engagement between government and Aboriginal communities on the WSP. I suspect there’s a lack of understanding – Aboriginal people don’t understand potential in the water space, and government don’t understand the cultural space’.*²³⁴
- **Current water management practices are not effective** – there are concerns regarding the health of waterways in the Plan area and the effectiveness of current management practices. This could be improved through valuing Aboriginal approaches to water management – *‘The experts say it’s okay but no one is asking us ... We need to continue to expand the cultural programs for land and water management to draw on the expertise of Aboriginal people ... Government has been talking about this for so long ... but nothing really happening at the scale it needs to – another example of all talk’.*²³⁵
- **There is limited trust and understanding between mining companies and local Aboriginal people** – while there are instances of respectful interactions, the relationships between mining companies and Aboriginal stakeholders in the area have been described as characterised by ‘disrespect’, ‘consultation fatigue’, ‘lack of trust’ and ‘tick-a-box cultural activities’ – *‘Local Aboriginal groups have had negative experiences with some mining companies. Cultural site mapping they undertake is at best a tick-a-box exercise and at worst they just don’t care and it’s more about working out what and how they can get rid of the sites for the*

²³¹ Interviews: Indigenous Land and Sea Corporation, 30 September 2019; Aboriginal Affairs NSW, 30 September 2019; NSW Aboriginal Land Council, 4 October 2019.

²³² Interview: Wanaruah Local Aboriginal Land Council, 29 October 2019.

²³³ Interview: Wanaruah Local Aboriginal Land Council, 29 October 2019.

²³⁴ Interview: Local Land Services, 6 November 2019.

²³⁵ Interview: Wanaruah Local Aboriginal Land Council, 29 October 2019.

*purposes of their mine plans. The mining companies themselves have so many supposed experts but we can see and feel the impacts’.*²³⁶

DPIE-Water should further engage with Aboriginal stakeholders in the Plan area as part of the Plan replacement process to better understand these values and risks.

The Commission notes the recent efforts of DPIE-Water in Aboriginal engagement as part of the water resource planning process for the Murray Darling Basin and in planning the Regional Water Strategies (see **Section 6.2.3**). DPIE-Water should continue these efforts and draw on established guidelines, including Aboriginal waterways assessments²³⁷ and cultural flows assessments²³⁸, and other sources of information.²³⁹ These existing guides can be adopted 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, including the Plan area.

6.2.2 Aboriginal water access and use needs improvement

Aboriginal-specific purpose licences are the primary mechanism to enable Aboriginal water 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, restrictions to use, and prohibition of trade.²⁴² These features, together with limited awareness of these licences within Aboriginal

²³⁶ Interview: Wanaruah Local Aboriginal Land Council, 29 October 2019.

²³⁷ 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>).

²³⁸ 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>).

²³⁹ Other sources of information for the Plan area include: 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. 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*. 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.

²⁴⁰ Section 3 of 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’.

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.

communities, has meant that the actual uptake of specific purpose licences has been limited across NSW.²⁴³

In this Plan, an access licence of the subcategory 'Aboriginal cultural' is available and capped at 10 ML per year and is restricted to use for 'personal, domestic or communal purposes, including drinking, food preparation, washing, manufacturing traditional artefacts, watering domestic gardens, cultural teaching, hunting, fishing, gathering and for recreational, cultural and ceremonial purposes'.²⁴⁴

The Plan also includes reference to an unregulated river (subcategory 'Aboriginal community development') access licence being available under certain restrictions of extraction and trade²⁴⁵ but does not provide an allocation in the Plan itself (unlike in other water sharing plans). The background document explains that access to these licences is restricted in some parts where rivers are already 'stressed'. However, in other coastal rivers where there are higher and more reliable flows there is an '*opportunity for licences to be granted for Aboriginal Community Development activities, provided this additional extraction would not negatively impact on ecological values that are dependent on high flows ... and would never exceed 500 ML per year per water source*'.²⁴⁶

Despite the availability of licences in the Plan, the Commission has not been provided with any evidence or reporting on their access and use. In addition, stakeholder feedback confirms that these licences have not been applied for or used in the Plan area. 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.²⁴⁷ Stakeholder feedback suggests that the limitation of uses and ineffective engagement with Aboriginal stakeholders regarding available entitlements has resulted in a lack of awareness and uptake of these licences,²⁴⁸ with stakeholders noting that '*there is no ability to harvest or use water for economic and other purposes*' and '*[DPIE-Water] needs to look more closely at how it can contribute to Aboriginal economic health in the Hunter*'.²⁴⁹

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 Part 8, Clause 34(6/6A) of the Plan.

²⁴⁵ This category of licence is not fully commercial. While they may be temporarily traded, they cannot be subject to permanent trade and as such will remain in the Aboriginal community for the life of the licence. Aboriginal communities, enterprises and individuals are encouraged to seek financial assistance from funding bodies to purchase fully commercial licences. (Department of Water and Energy (2016) *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009 – Background document for amended plan 2016*, p. 15. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166849/hunter-unreg-alluvial-background.pdf).

²⁴⁶ Department of Water and Energy (2016) *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009 – Background document for amended plan 2016*, p. 15. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166849/hunter-unreg-alluvial-background.pdf.

²⁴⁷ 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., Betteridge, 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.

²⁴⁸ Interviews: Hunter Local Land Services, 6 November 2019; Individual, 6 November 2019; Aboriginal Affairs NSW, 30 September 2019; NSW Aboriginal Land Council, 4 October 2019.

²⁴⁹ Interviews: Individual, 6 November 2019; and, Hunter Community Environment Centre, 22 October 2019.

There are a range of barriers to Aboriginal people accessing water in NSW. These were identified in the review²⁵⁰ and confirmed during consultation²⁵¹ for this Plan and include:

- **legal restrictions** – limits to volumetric entitlement, restrictions to narrow ‘traditional water use’ purposes, exclusion of economic and commercial uses of water
- **complexity of water governance** – complicated licencing and application processes, reliance on lengthy and complex land rights processes for accessing water
- **limited awareness and capability** – of Aboriginal peoples in water policy, licensing and governance
- **lack of infrastructure and access** – restricted physical access to land and water, lack of infrastructure to use water, for example pumps and dams.

Aboriginal stakeholders who spoke with the Commission also indicated it was particularly challenging in coastal areas to maintain cultural connections with waterways due to the history and patterns of settlement which establish high economic value and limited access to waterfront land.²⁵²

DPIE-Water should address the significant barriers to Aboriginal people accessing and using water. DPIE-Water should consider actions to simplify Aboriginal licence categories and processes. This may include the simplification of licence categories and removal of unnecessary restrictions on the purpose of water use.²⁵³

6.2.3 Aboriginal involvement, capability-building and leadership in water should be supported

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 has been very limited engagement with Aboriginal stakeholders beyond the early phases of Plan development. The Hunter Aboriginal Community and Environment Network was consulted twice during the Plan public exhibition period, in October 2005 and June 2006. In the last meeting, a process to liaise with Local Aboriginal Land Councils was developed but this was only conducted with two Local Aboriginal Land Councils outside the Plan area.²⁵⁴

There is no evidence of any meaningful and ongoing attempts to involve Aboriginal people in planning and water management in the Plan area. Stakeholders described this as being the

²⁵⁰ Jackson, S. and Moggridge, B. (2019) ‘Indigenous water management’, *Australasian Journal of Environmental Management*, 26(3), pp. 193-196; Moggridge, B.J., Betteridge, 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.

²⁵¹ Interviews: 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.

²⁵² Interviews: Individual, 6 November 2019; Wanaruah Local Aboriginal Land Council, 29 October 2019.

²⁵³ 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.

²⁵⁴ Department of Water and Energy (2016) *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009 – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166849/hunter-unreg-alluvial-background.pdf.

result of a lack of awareness within the Aboriginal community and the inadequate levels of government-led engagement and capacity building.²⁵⁵

The Plan's background document emphasises the role of the *NSW Aboriginal Water Initiative*, and the supporting guide *Our Water Our Country*,²⁵⁶ in supporting the engagement process. 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.²⁵⁷

The Commission notes recent increases in DPIE-Water's Aboriginal liaison staff²⁵⁸ and their significant efforts in undertaking Aboriginal engagement as part of the Murray Darling Basin Authority's Water Resource Planning process.²⁵⁹ However, this process has not yet been extended to coastal areas and has been subject to criticism from some stakeholders that it has been exclusionary (due to a focus only on nation groups) and that the process was rushed and under-resourced.²⁶⁰ DPIE-Water have been working to improve the engagement process in consultation with a NSW Peak Aboriginal Bodies water reference group and will look to apply this as part of the regional water strategy planning process across NSW.

Across all water sharing plan reviews, there is consistent evidence and feedback that significant efforts are needed to address Aboriginal water values and uses, objectives and outcomes across NSW. In previous water sharing plan reviews, the Commission has consistently recommended a state-wide approach that is consistent and transparent, led by an overarching NSW Aboriginal water framework with supporting policy, governance, staff and resources – building on those initiatives in place previously under the Aboriginal Water Initiative (2012-17)²⁶¹ and Aboriginal Water Trust (2000-09).²⁶² The Commission has also identified valuable examples of such

²⁵⁵ Interviews: Hunter Local Land Services, 6 November 2019; Individual, 6 November 2019; Aboriginal Affairs NSW, 30 September 2019; and NSW Aboriginal Land Council, 4 October 2019.

²⁵⁶ NSW Office of Water (2012) *Our Water Our Country: An information manual for Aboriginal people and communities about the water reform process*. NSW Department of Primary Industries, Office of Water, NSW. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0004/547303/plans_aboriginal_communities_water_sharing_our_water_our_country.pdf.

²⁵⁷ 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.

²⁵⁸ Interview with Aboriginal Cultural Liaison Officer, DPIE-Water, 1 October 2019.

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

²⁶⁰ Interview: NSW Aboriginal Land Council, 4 October 2019.

²⁶¹ The aim of the initiative was to 'build Aboriginal peoples' capacity to participate as water users, protect their rights to water, maintain a healthy environment, and take full advantage of economic opportunities'. The initiative was resourced with Aboriginal staff that had experience and understanding of water management. The supporting guide, *Our Water Our Country: An information manual for Aboriginal people and communities about the water reform process*, provided detailed information and a DVD outlining the way water is managed in NSW and opportunities for Aboriginal people to be involved in the water sharing process – this included flowcharts on the licensing process and sample licence application forms.

²⁶² This statutory Trust was established under the *Water Management Act 2000* and operated until 2009. It provided specific purpose grant funding for water infrastructure (such as irrigation, pumps), and offered opportunities to establish water-based commercially viable enterprises. The Trust provided funding to 16 Aboriginal communities. Stakeholders identified the Trust as an important body for representing the interests of Aboriginal people in terms of economic policy and commercial developments. See: www.water.nsw.gov.au/__data/assets/pdf_file/0004/547303/plans_aboriginal_communities_water_sharing_our_water_our_country.pdf.

approaches in other water sharing plan reviews.²⁶³ DPIE-Water are making significant progress on this state-wide framework in consultation with the NSW Peak Aboriginal Bodies group.²⁶⁴

The Commission 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.

6.3 Current town water needs are met but future risks need to be managed

The Plan's background document describes a key objective of the Plan 'to manage local water utility/major utility water supply for the benefit of the community whilst recognising the environmental needs of the water sources'.²⁶⁵ Water utilities are provided with water utility access licences that set the parameters for extraction. Under the Act, water utility extractions for town water supply are given higher priority than extractions for commercial purposes, such as irrigation.²⁶⁶ The Plan recognises this by providing a full share of water for annual town water supplies, apart from in exceptional drought conditions.

²⁶³ Examples include:

- Recent reforms in Victoria as part of the: *Aboriginal Water Policy (2016)* which included investment to identify Aboriginal water objectives and to develop a roadmap for water access for economic development; and, the *Water and Catchment Legislation Amendment Bill (2019)* that formalised obligations for water management agencies to engage with and support Aboriginal involvement as part of the 'Water for Victoria Plan' that set 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 murrn) 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, Cultural Flows Projects and officers).
- Aboriginal Water and Land Holder and an associated Trust Account. Note:
- 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)

²⁶⁴ Interview: Principal Aboriginal Policy and Legislation Officer - Water Policy & Legislation, DPIE-Water, 28 February 2020.

²⁶⁵ Department of Water and Energy (2016) *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009 – Background document for amended plan 2016*, p. 4.

²⁶⁶ *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'.

The *NSW Water Register* indicates that the local water utility share component is 5,418 ML per year (representing about one percent of total entitlement; see **Table 4** in **Section 2.3**), distributed across eight local water utility licences and water sources.²⁶⁷ The Commission notes that the Plan estimates the local utility share component as 5,597 ML per year across six water sources.²⁶⁸

Local water utilities supply other urban centres outside Hunter Water (major utility) areas. The bulk of this water is provided from the regulated river with a pipeline to Singleton from Glennies Creek Dam, and to Aberdeen, Scone and Murrurundi from Glenbawn Dam. Muswellbrook and Denman are supplied from pumps on the Hunter River. The village of Jerrys Plains receives a reticulated town water service. Jerrys Plains Water Supply Scheme is treated by AGL Macquarie, on behalf of Council and reticulated by Council.²⁶⁹ Towns such as Singleton and Scone generally have retained their entitlements for water under the Plan provisions, only using them in exceptional circumstances. However, many smaller towns still rely on unregulated rivers, such as Sandy Hollow's Water Treatment Facility that pumps water from bores on the Goulburn River.

The share components for major utility access licences is estimated at 346,700 ML per year across water sources²⁷⁰ (representing 62 percent of total entitlement; see **Table 4** in **Section 2.3**). There are five major utility licences held in the Plan area:

- Four are held by Hunter Water, with a total share component of 339,075 ML per year (note, Hunter Water's LTAAEL is set at 78,500 ML per year, which is only 22 percent of its total share component).
- One is held by AGL Macquarie for the Liddell power station with, a 7,700 ML per year share component in the Jerrys Plains Water Source – although the power station is committed to closing in 2022.²⁷¹

Hunter Water provides urban water supplies to Newcastle, Lake Macquarie, Maitland, Cessnock, Port Stephens, Branxton and Dungog LGAs. Water is extracted from the Newcastle (Grahamstown Dam) and Williams River water sources (Chichester Dam and Seaham Weir),²⁷² together with groundwater from the Tomago and Tomaree sandbeds and a small amount of water is also drawn from either the Paterson River or Allyn River to supply the town of Gresford.²⁷³ Hunter Water also supplies a small volume of bulk treated water to Midcoast Water

²⁶⁷ WaterNSW (2019) *Water Register*. Available at: <https://waterregister.watnsw.com.au/water-register-frame>. (Accessed 26 September 2019).

²⁶⁸ Part 7, Clause 28 of the Plan.

²⁶⁹ Singleton Council (2019) *Our Water Supply*. Available at: <https://www.singleton.nsw.gov.au/581/Our-Water-Supply>.

²⁷⁰ Part 7, Clause 29 of the Plan. The major water utility share component is distributed as follows:

- 100,000 ML/year in the Newcastle Water Source
- 239,000 ML/year in the Williams River Water Source, including 189,000 ML/year extracted at Balickera Pumping Station, and 50,000 ML/year extracted at Chichester Dam
- 7,700 ML/year in the Jerrys Water Source
- 0 ML/year in all other water sources.

²⁷¹ AGL (2019) *AGL Macquarie Power Stations – Latest Update*. Available at: <https://www.agl.com.au/about-agl/how-we-source-energy/agl-macquarie>.

²⁷² Department of Water and Energy (2016) *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009 – Background document for amended plan 2016*, p. 12. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166849/hunter-unreg-alluvial-background.pdf.

²⁷³ The Metropolitan Water Directorate (2014) *Lower Hunter Water Plan*. Available at: <https://www.hunterwater.com.au/Resources/Documents/Plans--Strategies/Lower-Hunter-Water-Plan.pdf>.

customers in Karuah and can supply and receive bulk treated water from Central Coast Council.²⁷⁴

The *Lower Hunter Water Plan 2014* sets out Hunter Water's future demand and supply requirements.²⁷⁵ Hunter Water's water access rules were also negotiated during the development of the *Lower Hunter Water Plan* to ensure consistency. In the Plan, the Lower Hunter's storage is forecast to supply the region for around 20 years based on estimated population growth and typical climate conditions.

The *Lower Hunter Water Plan* identifies several key factors that influence town water supply and demand and how this will change over time. These include population growth and demographic changes, variations in the housing mix, the water efficiency of households, changes in business and industry water use, and changes in rainfall patterns and drought.

The *Lower Hunter Water Plan* is currently being revised and is estimated for release in 2021.²⁷⁶

The region has demonstrated it is particularly vulnerable to drought – while Hunter Water's storages tend to remain at between 80 and 100 percent capacity, storages can fall very quickly during drought.²⁷⁷ Major storages recorded their lowest levels in 35 years in February 2020, with 38 percent for Chichester Dam and 53.5 percent for Grahamstown Dam.²⁷⁸ Level 2 water restrictions began on 20 January 2020 but these have been dropped to Level 1 restrictions following rain periods in early 2020.²⁷⁹ In addition to residential water restrictions, Hunter Water has also been focusing on efficiency measures and plans for large business users, which are their primary water users in the region.²⁸⁰

Besides Hunter Water's efficiency measures, other options being investigated²⁸¹ to ensure supply include:

²⁷⁴ Hunter Water (2019) *Water in the Lower Hunter*. Available at: <https://www.hunterwater.com.au/Water-and-Sewer/Water-in-the-Lower-Hunter/Where-Does-Our-Water-Come-From.aspx>.

²⁷⁵ The *Lower Hunter Water Plan (2014)* sets out the mix of supply and demand measures that will:

- provide water security during drought
- ensure reliable water supplies to meet growing water demand due to a growing population and increased business and industry activity
- help protect aquatic ecosystems
- maximise net benefits to the community.

²⁷⁶ Hunter Water Corporation (n.d.) *Planning for the future*. Available at: <https://www.hunterwater.com.au/our-water/water-supply/water-in-the-lower-hunter/planning-for-the-future>.

²⁷⁷ The Metropolitan Water Directorate (2014) *Lower Hunter Water Plan*. Available at: <https://www.hunterwater.com.au/Resources/Documents/Plans--Strategies/Lower-Hunter-Water-Plan.pdf>.

²⁷⁸ Hunter Water (2020) *Water Storage*. Available at: <https://waterstorage.hunterwater.com.au/> (accessed 30 March 2020).

²⁷⁹ Hunter Water plans to use Level 2 water restrictions to build on the significant savings already made by the users following the introduction of water restrictions three months ago. Since the start of Level 1 water restrictions, the community has used 17 percent less water than what was expected (Hunter Water (2020) *Water Storage*. Available at: <https://waterstorage.hunterwater.com.au>).

²⁸⁰ Hunter Water has also been working closely with large business customers who use more than 10 million litres of water a year to develop water efficiency management plans, which will be expanded to smaller business customers as they start preparing their own plans.

²⁸¹ Most of these options were also considered as part of a review and benefits assessment for Upper Hunter water policy, infrastructure options and management. See: Alluvium and Marsden Jacob (2017) *Hunter Distribution of Benefits Assessment, and Hunter Preliminary Economic Appraisal, Including Strategic Policy Review and Modelling Review*. Final Report for Steering Committee, provided to Department of Primary Industries – Water, August 2017.

- desalination²⁸²
- investigating new groundwater supply options
- recycled water and stormwater harvesting
- water sharing between regions through connecting infrastructure.²⁸³

Considering these factors and the priority level of town water supply, it is critical to research, monitor and adaptively manage key risks to town supply including:

- population projections and changes in water demand²⁸⁴
- ongoing climate change research to better understand the implications
- drought events and impacts on supply
- long term water demand and supply options for the future.²⁸⁵

DPIE-Water should ensure the replacement Plan aligns with the research, plans and trends outlined in the *Greater Hunter Regional Strategy 2018*, *Lower Hunter Water Plan* and the Hunter Water Operating Licence. DPIE-water need to include identified risks to town water as part of the MER requirements of the Plan (see **Chapter 8**).

6.4 Equitable water sharing provisions could be better communicated

DPIE-Water advised that equitable sharing between users relates to the appropriate prioritisation of different licence classes under the Act.²⁸⁶ However, stakeholder feedback suggests that there is confusion regarding the application of equitable water sharing among users and concerns around whether this is being achieved.²⁸⁷ Accordingly, DPIE-Water should better communicate how equitable water sharing is defined and assessed in the Plan remake, including by identifying an appropriate performance indicator. Although equity can be difficult to define, transparency and measurement of the ways in which water is shared can build

²⁸² Hunter Water recently lodged an environmental impact statement for a \$100 million desalination plant at Belmont that will be used if the region's water storages reach critical levels – when storages drop to between 35 and 40 percent. The plant, to be built adjacent to the wastewater treatment plant, would be switched on when storages reach 15 percent and produce 15 million litres of water a day or 10 percent of the region's water needs. (Kelly, M. (2019) 'Hunter Water lodges environmental impact statement for desalination plant at Belmont South'. *Newcastle Herald*, October 29).

²⁸³ Hunter Water (2020) *Planning for the Future*. Available at: <https://www.hunterwater.com.au/Water-and-Sewer/Water-in-the-Lower-Hunter/Planning-for-the-Future.aspx>.

²⁸⁴ The population in Hunter Water's area of operations is expected to reach around 650,000 by 2036, a 25 percent increase since 2011. The current water supply system can supply an average of around 75 billion litres of water each year. Considering forecast population growth of just over 100,000 and water consumption trends, there will be enough water to supply the region for around 20 years under typical climate conditions. (The Metropolitan Water Directorate (2014) *Lower Hunter Water Plan*. Available at: <https://www.hunterwater.com.au/Resources/Documents/Plans--Strategies/Lower-Hunter-Water-Plan.pdf>).

²⁸⁵ Use of portable desalination units is identified in the plan as one way of diversifying the Lower Hunter's water supply sources and reducing the risk of running out of water in an extreme drought and resilience during climate change. Temporary desalination facilities offer a flexible contingency measure at a relatively low expected cost compared with other measures, as they would only be installed in a very rare drought and as late as possible (The Metropolitan Water Directorate (2014) *Lower Hunter Water Plan*. Available at: <https://www.hunterwater.com.au/Resources/Documents/Plans--Strategies/Lower-Hunter-Water-Plan.pdf>).

²⁸⁶ DPIE-Water, personal communication, 27 March 2019.

²⁸⁷ Interviews: Hunter Community Environment Centre, 22 October 2019; NSW Irrigators Council, 21 October 2019; Individual, 6 November 2019.

stakeholder support and understanding of how decisions around the prioritisation of different licence classes are made.

Equity assessments may be useful in developing revised Plans to ensure they meet this objective. While there is no standard methodology to undertake 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.

6.5 Recommendations

The Commission presents the following recommendations (**Table 14**) and suggested actions (**Table 15**) for strengthening how users share water.

Table 13: Recommendations for DPIE-Water

Recommendations	
9*	Continue processes to develop the reasonable use guidelines for stock and domestic use by the end of 2020 and include the agreed standards as part of the replacement Plan.
10	Include a performance indicator for harvestable rights in the MER framework (see Recommendation 24).
11*	Include a provision to amend native title rights, with 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 water allocation process.
12*	Identify Aboriginal values and uses, objectives and outcomes, and flow allocations in the Plan area, using a strengthened NSW Aboriginal Water Framework (see Suggested action A).
13*	Co-design licences or other water access options with Aboriginal stakeholders that meet identified needs (for a range of cultural, environmental, social and economic uses) and include these in the Plan, using a strengthened NSW Aboriginal Water Framework.
14	Ensure the replacement Plan aligns with identified risks to town water supply in key research, plans and projections (<i>Greater Hunter Regional Strategy 2018</i> , <i>Lower Hunter Water Plan</i> and the Hunter Water Operating Licence). Include identified town water risks as part of MER requirements of the Plan (see Recommendation 24).
15*	Better define and communicate equitable water sharing and include a performance indicator for equitable water sharing in the MER framework for the Plan so that it can be monitored and assessed (see Recommendation 24).

Table 14: Suggested actions for DPIE-Water

Suggested action	
A*	<p>Continue development of the NSW Aboriginal Water Framework by the end of 2020 to provide consistent and transparent guidelines and resourcing for Aboriginal involvement in water planning and management in NSW. At a minimum, the framework should align with relevant international and national guidelines, key legislation, and consider the following criteria:</p> <ul style="list-style-type: none">a) consideration of a range of Aboriginal water values and its usesb) processes for allocating water for Aboriginal interests including cultural, environmental, social and economic purposesc) processes for improving Aboriginal water access and use, through simplified licencing or other co-designed mechanismsd) identification of any issues requiring broader legislative reforme) clear requirements for including native title determinations and proactive processes for undertaking other land/water use agreementsf) strengthened Aboriginal engagement processes across the state involving a broad stakeholder base including Traditional Owners, First Nation groups, Local Aboriginal Land Councils and any other relevant groupsg) appropriate Aboriginal-led governance and decision-making arrangementsh) initiatives for capability building, water ownership and leadership, such as an Aboriginal Water Holderi) adequate resources including dedicated Aboriginal staff with capability in water planning and management, and funding, such as an Aboriginal Water Trust.

7 Provisions related to where water can be extracted from

This chapter explores how effectively the provisions of the Plan govern the level of extraction and types of activities that can occur in different water sources across the Plan area based on their different environmental, social and economic risks. It focuses on the following aspects of the Plan:

- water source classifications, which classify each water source based on its instream and economic values and risks to determine the rules that are applied to manage these values and risks²⁸⁸
- access licence dealing rules, which encourage trading of water access licenses to the highest value use within sustainability and system constraints²⁸⁹
- rules to protect groundwater dependent ecosystems across different parts of the Plan area.

7.1 Water source classifications should be updated

Water source classifications impact where water can be extracted from, and where trading may occur. In developing the Plan, the Hunter Regional Panel classified each water source according to its instream (ecological) and economic values. A high, medium or low rating was applied. These classifications were used to determine 'the optimal balance between extraction and retention of water instream for each water source'.²⁹⁰ Two matrices were developed in this process:

- The 'value matrix', which rated a water source's instream value against its hydrologic stress and was used to determine trading rules.
- The 'risk matrix', which rated the risk of extraction to instream values against community dependence on extraction and was used to determine water access rules.

A review of current classifications found that key instream (ecological) and economic values may not be identified in some water sources and the information used to determine current classifications was limited. Under the Plan, this may have impacted on where water can be extracted and traded.

7.1.1 Instream values

The Plan currently identifies 11 water sources as having high instream (ecological) value. Factors used to determine instream values included 'the presence of threatened fauna and other biota that are likely to be affected by extraction', as well as species diversity, wet flora quality, riparian vegetation, fish community integrity, listed wetlands, world heritage or wilderness

²⁸⁸ DPI-Water (2016) *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Source – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166849/hunter-unreg-alluvial-background.pdf.

²⁸⁹ Part 12 of the Plan.

²⁹⁰ DPI-Water (2016) *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Source – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166849/hunter-unreg-alluvial-background.pdf.

values and whether the source is a drought refuge for platypus and other aquatic species (see **Section 2.7**).²⁹¹

Three water sources that had ten or more threatened species in their catchments were not classified as having high instream values. These were the Lower Wollombi Brook, North-Lake Macquarie and South Lake Macquarie water sources.²⁹² These water sources should be reassessed to determine if they have high instream values and, if so, have appropriate cease to pump rules established. As threatened species listings may have changed over the Plan period, the assessment of instream values across all water sources should be updated to reflect this.

In addition, in setting the flow rules DPIE-Water should consider additional key environmental assets (or values) and functions such as system connectivity, adequate water quality and in-stream habitats. These assets and functions have individual requirements within the flow regime, for example, very low flows, low flows, baseflows and overbank flows. The magnitude, frequency, duration, timing or seasonality, rate of change and return period required for environmental assets should be established as part of the assessment of instream values.

The reassessment of instream values should draw on existing studies in the Plan area previously mentioned in this report, including the Bioregional Assessment for the Hunter subregion and the whole-of-government hydrodynamic model of the Hunter estuary.

7.1.2 Economic values

The Plan currently identifies six water sources as having high economic dependence. These appear to have been defined based on a reasonably narrow range of industries, including irrigated agricultural production, vineyards, horse studs and tourism.²⁹³ While these are important industries in the Plan area, there have been significant increases in water use from other major extractive industries since the Plan commenced. There has been a particular increase in extraction of water for mining under unregulated and alluvial access licences over the Plan period.

The *Greater Hunter Regional Water Strategy* notes that, as mine development grew between 2004 and 2013, water needs that were initially met by high security entitlements in the Regulated Hunter River but have since been increasingly met by water from other licence categories and water sharing plans. This was primarily from regulated river general security entitlements, porous and fractured rock groundwater and some regulated alluvial groundwater, but also included water from the unregulated river system.²⁹⁴ The use of unregulated and alluvial access licences appears to have continued to grow over the life of the Plan. The strategy shows that unregulated and alluvial access licences for mining totalled less than 4,000 ML in 2013 (three years after Plan commencement). Data on entitlement held by mining companies (aquifer and

²⁹¹ DPI-Water (2016) *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Source – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166849/hunter-unreg-alluvial-background.pdf.

²⁹² *Ibid.*

²⁹³ Water sources classified with high economic dependence included Black Creek, Darbrook, Halls Creek, Lower Goulbourn, Lower Wollombi and Pages river (*Ibid.*).

²⁹⁴ 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.

unregulated access licences) indicates that this has increased to an estimate of just over 22,000 ML in 2018-19, or 17 percent of total share components under the Plan.²⁹⁵

Given the significant value of water to many industries in the region, comprehensively identifying industries and the water sources they are dependent on for extraction is an important consideration. The replacement Plan should reassess and, where appropriate, reclassify the economic dependence of water sources with consideration of the water needs of industries such as mining, power generation, aquaculture and recreational fishing, in addition to industries previously identified as having high economic dependence.

As demonstrated by the growth in water use for mining of the previous Plan period, the assessment should also consider predicted trends in the Plan area's industry profile when designing Plan provisions. The NSW Government has identified potential industry opportunities for the Upper Hunter in its *Upper Hunter Economic Diversification Action Plan*.²⁹⁶ These opportunities include:²⁹⁷

- **expanding agribusiness** – including the potential expansion of existing industries and emerging and new industries such as industrial hemp and processing of dairy, pork, poultry and hemp
- **continuing mining and engineering services sector** – with coal mining remaining a major industry
- **transitioning power and energy sector** – with potential new generation from gas and renewables, energy innovation centres and advanced manufacturing.

The strategic priorities of the action plan that can be directly supported by the Plan provisions include planning for water security for key and new targeted industries and encouraging new industry investment through better land use planning and improved access to land. While the action plan does not cover the whole Plan area, it should be used to inform Plan provisions that can accommodate future changes in industry as part of the reclassification process.

7.2 There are trade opportunities but interest in increasing flexibility

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 Plan sets access licence dealing rules to encourage the movement of water access licences to the highest value use, while protecting environmental values of water sources and preventing transfers into stressed water sources.

These rules were developed in line with the *Access Dealing Principles Order 2004* and principles in the Plan's background document. The *Access Dealing Principles Order 2004* requires rules to meet environmental requirements,²⁹⁸ and prevent adverse impacts on basic landholder rights

²⁹⁵ Based on data extracted from the NSW Water Register (WaterNSW (2019) *NSW Water Register*. Available at: <https://waterregister.watarnsw.com.au/water-register-frame>.

²⁹⁶ NSW Government (2018) *Upper Hunter Economic Diversification Action Plan: Implementation Priorities*. Available at: <https://strategicservicesaustralia.com.au/wp-content/uploads/2018/07/20180719-UH-Economic-Diversification-Action-Plan-Implementation-Priorities-FINAL.pdf>.

²⁹⁷ *Ibid.*

²⁹⁸ Clause 7 of the *Access Licence Dealing Principles Order 2004* states that trades should:

- not adversely affect environmental water and water dependent ecosystems identified in the Plan
- be consistent with any strategies to maintain or enhance water quality
- not increase commitments to extract from water sources identified in the Plan as high conservation value

and features of major cultural, heritage or spiritual significance.²⁹⁹ The Plan's background document also outlines the principles used to develop the access licence dealing rules.³⁰⁰

While the Plan provided opportunities for trade, some stakeholders considered that trading was limited by restrictive trade rules that limit the movement of water entitlements and allocation between licensed users in the Plan area. They also noted errors and inconsistencies in trade rules across Plan documents, which creates uncertainty for water market participants.

7.2.1 Trades have occurred over the Plan period

According to the *NSW Water Register*, 1,398 trades occurred during the Plan period, including transfer trades (71M, 71X and other) and share assignment trades (71Q) (**Table 16**).

Most trades (98 percent of total transactions) were transfer trades, which involve a change in ownership of an access from one licence holder to another. Most of these were for unregulated river licences (639), alluvial aquifer licences (351) and domestic and stock licences (115).

There were 22 share assignment trades (1.6 percent of total transactions) over the plan period. This type of trade involves the transfer of all or part of the share component of one access licence to another. These trades were evenly split between unregulated river licence (11) and aquifer licences (11) trades (**Table 16**).

There were only four temporary allocation assignment trades (71T) over the Plan period (**Table 16**). These trades involve the transfer of a volume of water from the account of one access licence to another. The former DPI Office of Water draft internal audit report stated that temporary trades were restricted due to the lack of account balance information and metering (a requirement for temporary trading).³⁰¹

Trades over the Plan period have a total reported value of almost \$19 million, although DPIE-Water has indicated that the available pricing data are incomplete and unreliable on a grouped basis. Factors contributing to inconsistencies include data entry errors, confusion about reporting form requirements and the inclusion of land assets in prices.³⁰² In some cases, trades are registered with a zero-dollar price. This may represent transfers between related entities or family businesses but may also reflect a reluctance from licence holders to disclose trade prices.

DPIE-Water indicated that the price of land and water can sometimes be bundled together when both types of assets are included in the same sale, when entered the Water Access Licence Register. This register includes water access licence transfers and is managed by NSW Land

- not increase commitments to extract above sustainable levels identified in the Plan.

²⁹⁹ The *Access Licence Dealing Principles Order 2004* provides guidelines for considering impacts of water dealings including new categories, subdivision, consolidation, assignments of rights or allocation, changing water sources, amending extraction components and interstate dealings. (Parliament of NSW (2004) *Access Licence Dealing Principles Order 2004*. Available at: https://www.legislation.nsw.gov.au/~/_/view/regulation/2004/433/full).

³⁰⁰ NSW Department of Water and Energy (2009) *Hunter unregulated and alluvial water sources guide*. Available at: www.water.nsw.gov.au/__data/assets/pdf_file/0006/549006/wsp_hunter_guide.pdf.

³⁰¹ DPI-Office of Water (2014) *Draft Audit of Implementation – Hunter unregulated and alluvial water sharing plan audit report card – Prepared for the period between 1 July 2009 and 30 June 2014*, (unpublished).

³⁰² Interview: DPIE-Water, 5 November 2019.

Registry Services.^{303,304} In these instances, it can be difficult to separate out the price paid for the water licence(s) from the price paid for land, 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 \$706 per ML for these trades; however, this is based on a small sample size of 22 trades and it is therefore unknown if these prices reflect the real value of water entitlements in the region.

Table 15: Summary of water access licence trades, 2009-10 to 2018-19³⁰⁵

Trade type	Licence category	Number of transactions	Total volume (ML) or share component (units)	Total reported price
Transfer trade (71M)	Unregulated River	639	46,964	\$5,554,116
	Aquifer	351	51,929	\$11,876,997
	Major Utility	1	7,700	-
	Domestic and Stock	115	796	\$14,600
	<i>Sub-total</i>	1,106	98,893	\$17,445,714
Transfer trade (Other)	Unregulated River	156	10,716	-
	Aquifer	81	11,295	-
	Domestic and Stock	21	120	-
	<i>Sub-total</i>	258	22,131	-
Transfer trade (71X)	Unregulated River	6	1,725	-
	Aquifer	2	539	-
	<i>Sub-total</i>	8	2,264	-
Share assignment trade (71Q)	Unregulated River	11	569	\$180,040*
	Aquifer	11	1,313	\$1,148,308
	<i>Sub-total</i>	22	1,882	\$1,328,348
Allocation assignment (71T)	-	-	-	-
	<i>Sub-total</i>	4-	318	\$210,900 -
Total		1,398	125,488	\$18,984,962

³⁰³ Water access licence transactions include transfers of ownership, mortgages, charges, caveats and related transactions and are registered on the appropriate folio using forms called 'Water Access Licence Dealings' (NSW Land Registry Service (2019) *Water Access Licence Register*. Available at: <https://nswlrs.com.au/Public-Register/WAL-Register>).

³⁰⁴ Interview: DPIE-Water, 31 October 2019.

³⁰⁵ WaterNSW (2019) *NSW Water Register*. Available at: <https://waterregister.watnsw.com.au/water-register-frame>.

7.2.2 There is stakeholder interest in increasing trade flexibility

While trading rules have been established, some stakeholder submissions considered that trade and the establishment of an efficient water market has been restricted by inflexible trading rules:

'The operation and effectiveness of water trading in coastal valleys is ineffective ... currently stifled by small trading areas based on types of flows ... This has resulted in limited trading taking place and led to a breakdown of the market system. As a result of limited trading, water prices are lower than normal'.³⁰⁶

'Some water sources have limited numbers of existing access licences, and/or highly inflexible rules for dealing between sources/management zones ... These sources often do not operate as a market, potentially frustrating State Significant Development mining projects that the Government of NSW has assessed and approved to be conducted in the public interest'.³⁰⁷

According to the publicly available NSW Water Register, there have been no transfer, share assignment or allocation assignment trades between water sources over the Plan period. This is consistent with the stakeholder feedback that trade has not been occurring between different areas across the Plan. Additional data provided by DPIE-Water for this review supported this finding and indicated that there has only been one share assignment trade between different water management zones.

Stakeholders who raised these concerns noted several ways that flexibility in trade could be improved, including facilitating trade between water sources, within water sources, and between regulated river and aquifer water access licence categories.

Mining stakeholders also recommended that trade flexibility be increased in other ways. For example, one submission recommended that the NSW Government formally documents that mines are only required to hold sufficient water access licences to address predicted inflows on an annual basis and that excess entitlements can be traded.³⁰⁸ Another submission recommended that policies are clarified to demonstrate to the Independent Planning Commission that mining projects only require licences at the time they use water.³⁰⁹ The Commission considers these issues require a state-wide policy approach and are beyond the scope of a single water sharing plan review.

Some stakeholders using water for irrigation also noted that they hold access licences with 'whole-of-source' conditions for trading, and their expectation is that they should be able to trade across water sources but have not been permitted to do so. The Commission has not investigated conditions on individual access licences and cannot comment as to the accurateness and extent of this issue, but DPIE-Water should review licence conditions to determine if they accurately reflect Plan provisions. Any errors in current licence conditions should be addressed as soon as possible. This will provide clarity for water users and help manage their expectations around trading.

Given the value of water to the Hunter region, as part of the Plan remake, the Commission sees merit in reviewing the trade rules outlined in the Plan and the *Access Licence Dealing Principles*

³⁰⁶ Submission: NSW Irrigators Council, received 25 October 2019.

³⁰⁷ Submission: Peabody Energy Australia, received 16 September 2019.

³⁰⁸ Submission: Peabody Energy Australia, received 16 September 2019.

³⁰⁹ Submission: NSW Minerals Council, received 24 October 2019.

*Order*³¹⁰ prior to the remake of the Plan to determine if they can be revised to support more trade, provided they:

- are supported by hydrological assessments demonstrating that predicted water takes do not result in material impacts to other water users or the environmental water reserve
- in line with the Act, ensure that water sources of high ecological value are protected.

As part of this review, DPIE-Water should review whether there may be new options for 'smarter' trading rules that allow for more flexible trade without compromising environmental values.

One example to be considered by DPIE-Water is trading low to high flow licences. The Plan currently provides for the conversion of low flow to high flow licences in certain water sources,³¹¹ where the licence holder sacrifice access to lower flows in exchange for additional entitlement. It may be feasible to allow trading into these water sources, where the traded licence or entitlement is only allowed to access higher flows but without any increase in entitlement.

DPIE-Water should also review all trade provisions in the Plan for possible drafting errors and to ensure they reflect the intent of the Plan and make immediate amendments, where required.

Any changes to access licence dealing rules would need to include broad stakeholder consultation to raise an appropriate level of awareness and understanding of the rules and assist in identifying any perverse or unintended outcomes.

7.3 Licence conversion provisions should be clarified

The Plan provides for the conversion of some access licences from one category to another. The Commission identified two issues with the current conversion provisions. The first relates to inconsistencies in the licence conversion rules documented in the Plan and the Plan report cards for certain water sources. The second relates to the basis for certain conversion restrictions in water sources that may be connected.

The Plan allows for the conversion of unregulated river access licences to aquifer access licences across the Plan area.³¹² However, mining industry stakeholders noted inconsistencies in the way these licence conversion rules are documented in the Plan compared to the trading rules provided in the report cards for various water sources, including Muswellbrook, Glennies and Singleton water sources. The report cards state that the conversion of unregulated river access licences to aquifer access licences is not permitted, which is inconsistent with the Plan provisions, as well as the provisions of other upriver water sources.³¹³

³¹⁰ Currently, the rules outlined in the *Access Licence Dealing Principles Order* prohibit the assignment of water allocations between access licences relating to different water sources that have no hydrologic connection (see Clause 17,3(b)). For example, water cannot be traded from Lake Macquarie, a recognised high ecological value water source to the Hunter Valley.

³¹¹ These water sources are: Pages River, Isis River, Lower Wollombi Brook, Rochel Brook and Paterson/Allyn Rivers.

³¹² Clause 72(2)(a) of the Plan.

³¹³ Submission: NSW Minerals Council, received 24 October 2019.

The Plan also allows for the conversion of an aquifer access licence to an unregulated river access licence in 19 water sources.³¹⁴ The Commission understands that the level of connectivity between surface and alluvial water would have been a driver for conversions provisions, with conversions being supported in more connected systems. However, the Plan's background document states that the water sharing rules for the highly connected upriver alluvial systems are based on several principles, including permitting within water source licence conversions of surface to groundwater licences but not the reverse. It does not state why the 19 water sources were selected for groundwater to surface water licence conversions.

Some stakeholders considered that rules for conversions from alluvial access licences to unregulated river access licences were inconsistent across upriver alluvial aquifers, allowing conversion only in some highly connected water sources. Given that upriver alluvial aquifers in the Plan are classified as highly connected, stakeholders considered that this type of conversion should be permitted, provided there were no impacts to the environment or surrounding water.

For conversions between groundwater to surface water licences, the Commission considers that any inconsistencies and errors between the Plan, report cards and other supporting documents should be addressed prior to the replacement Plan, and conversion requirements should be clearly communicated to licence holders to minimise confusion. As part of this work, DPIE-Water should also review the consistency of access rules, such as cease to pump rules, between surface water and aquifer licences in highly connected systems where conversions are to be allowed. The purpose of this review would be to ensure licenced users are subject to similar access rules before and after licence conversion.

7.4 Groundwater dependent ecosystem protections can be strengthened

Water sharing plans are required to protect and enhance groundwater dependent ecosystems. While water sources cover large areas, impacts to groundwater dependent ecosystems are often localised and require specific rules in addition to the broader rules covering the water sources. 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
- aligning Plan provisions with the *NSW Aquifer Interference Policy*.

7.4.1 Groundwater dependent ecosystems should be listed in the Plan

The Plan is required to provide a list of groundwater dependent ecosystems in Schedule 4 but does not do this. The Plan's background document describes what a groundwater dependent ecosystem is and the provisions to protect them. It also does not provide a clear list of groundwater dependent ecosystems but identifies in the text some cave ecosystems that are protected under the Plan.

³¹⁴ Clause 72(2)(b) of the Plan. Conversions are allowed in the following water sources: Martindale Creek, Doyles River, Dart Brook, Pages River, Upper Wollombi Brook, Lower Wollombi Brook, Munmurra River, Krui River, Bow River, Merriwa River, Halls Creek, Baermai Creek, Widden Brook, Bylong River, Wollar Creek, Jerrys, Hunter Regulated River Alluvial, Upper Goulburn River and Lower Goulburn River.

The Plan links to maps of groundwater dependent ecosystems as an attachment. As there is no complete list it is unclear if this map is accurate. However, there appear to be inconsistencies based on the information provided in the background document. For example, they do not include detailed restrictions for groundwater dependent ecosystems in the Upper and Lower Goulburn water sources³¹⁵ or groundwater dependent ecosystems in the Hunter Regulated River Alluvial Water Source or the Isis River cave systems.³¹⁶

The replacement Plan should include all identified groundwater dependent ecosystems in associated maps and tables. To provide clarity for users, the Plan report cards should also be revised to accurately list groundwater dependent ecosystem rules.

The *Bureau of Meteorology Groundwater Dependent Ecosystem Atlas* is generally regarded as the best available reference point for ecosystem identification and is intended to be updated regularly with state-based data, requiring ongoing collaboration and maintenance.³¹⁷ DPIE-Water have advised that it will soon publish a state-wide groundwater dependent ecosystem assessment which will update the Atlas. During Plan development, available data should be ground-truthed and additional ecosystems included as necessary. This would give effect to the provisions included in the Plan to protect groundwater dependent ecosystems.

7.4.2 Protections for groundwater dependent ecosystems can be clarified

The Plan currently only applies to high-priority groundwater dependent ecosystems (if identified), whereas low and medium priority ecosystems are considered in other legislation such as the *Environmental Planning and Assessment Act 1979*. The Plan should clarify terminology and the extent of protection of low and medium priority groundwater dependent ecosystems. This is important given the classification of high priority or high ecological value ecosystems is inconsistent across policies.

Groundwater dependent ecosystems are classified according to the ecosystems they support (**Table 17**). 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. The Plan should specify which types of groundwater dependent ecosystem are to be considered as it currently appears to be limited to Type 2 ecosystems. During Plan development, all ecosystems should be identified, and their groundwater and surface flow requirements should be defined as appropriate.

³¹⁵ Clause 41(2) of the Plan.

³¹⁶ DPI-Water (2016) *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Source – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166849/hunter-unreg-alluvial-background.pdf.

³¹⁷ Bureau of Meteorology (2019) *Groundwater Dependent Ecosystems Atlas*. Available at: <http://www.bom.gov.au/water/groundwater/gde/>.

Table 16: Classification of groundwater dependent ecosystems³¹⁸

Type 1	3	Ecosystems living in an aquifer - for example stygofauna, which is fauna found in groundwater systems such as caves ³¹⁹
Type 2	4	Ecosystems supported by discharging groundwater to the surface - for example wetlands, seeps, springs and river baseflow
Type 3	5	Ecosystems supported by the subsurface presence of groundwater - for example deep-rooted terrestrial vegetation

The recognition of surface and groundwater connectivity should be retained in the Plan. However, this can be strengthened to explicitly acknowledge the varying spatial and temporal scales, as well as the two-way relationship between surface and groundwater recharge and loss.

7.4.3 Plan provisions should align with the *NSW Aquifer Interference Policy*

The *NSW Aquifer Interference Policy*³²⁰ is designed to holistically protect groundwater dependent ecosystems, considering both potential water level and quality impacts.³²¹ It outlines a comprehensive approach to groundwater dependent ecosystem protection and includes a method to assess set back distances and a reporting framework. The *NSW Aquifer Interference 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.

The Plan includes water supply works approvals near groundwater dependent ecosystems, specifically a range of setback distances for work near groundwater dependent ecosystems.³²² Set back distances aim to minimise the potential impacts of groundwater extraction on environmental features, including groundwater dependent ecosystems. The Plan also has provisions for the Minister to require the proponent to submit a hydrogeological study to demonstrate there will be minimal or no greater impact on groundwater dependent ecosystems.

These clauses should be retained but aligned with the *NSW Aquifer Interference Policy*, including for setback distances. Caveats should be retained that give the Minister discretion to vary these distances, provided adequate studies are undertaken.

³¹⁸ These types are used by the Bureau of Meteorology and the Independent Expert Scientific Committee in its guidelines to assess groundwater dependent ecosystems.

³¹⁹ The Commission notes that DPIE-Water is progressing research into the science behind stygofauna watering requirements. These requirements are currently largely unknown making rule development difficult.

³²⁰ 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.

³²¹ 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.

³²² Part 9 of the Plan.

7.5 Recommendations

To strengthen rules governing where water can be extracted, the Commission makes the following recommendations (Table 18).

Table 17: Recommendations for DPIE-Water

Recommendations	
16	For the replacement Plan, review all water sources and determine which water sources should be classified as having high ecological value, using all available data and the latest classification methods.
17	Reassess the economic dependence of each water source in the Plan area to inform the development of the replacement Plan. The assessment should assess the full range of current and future industries and activities that will require access to secure water, including: <ul style="list-style-type: none">a) extractive industries (for example, dairy, beef, mining)b) non-extractive industries (for example, tourism, aquaculture)c) ecosystem services (for example, recreation, amenity).
18	For the replacement Plan in 2022, review current trading rules and the Minister's <i>Access Dealing Principles Order</i> to determine if they can be revised to support more trade. This review should consider: <ul style="list-style-type: none">a) environmental impacts of any potential changes and ensure environmental outcomes can be maintainedb) whether new options such as trading from low to high flow licences may allow for greater levels of trade without compromising environmental values.
19	By end of 2020, review and amend any drafting errors in the Plan around trade and ensure report cards and licence conditions are consistent and clearly communicated to licence holders.
20	For the replacement Plan in 2022, review the Plan, report cards and other supporting documents and update as required to ensure consistency in stated conversion requirements for surface water to groundwater licences. Once clarified, conversion requirements should be clearly communicated to licence holders.
21	For the replacement Plan in 2022, assess the appropriateness of restrictions on groundwater to surface water licence conversions in highly connected upriver alluvial water sources. This should involve consideration of the potential to allow conversions from alluvial to unregulated river access licences to increase the flexibility of water access for users. This assessment should also consider the cease to pump rules for these management zones or water sources. If they are connected for licence conversions and trading, they should also be connected for access rules.

Recommendations

In the replacement Plan by 2022, improve the protection of groundwater dependent ecosystems by:

- 22
- a) listing all identified groundwater dependent ecosystems in Schedule 4 of the Plan, as well as in associated maps and documents
 - b) identifying high, medium and low priority groundwater dependent ecosystems in the Plan and referring to them explicitly as relevant in any groundwater dependent ecosystem protection provisions
 - c) clearly defining groundwater terms and their relevance to the Plan, including connectivity, ecological value, potential and type
 - d) standardising set back distances for work near identified groundwater dependent ecosystems based on the *NSW Aquifer Interference Policy 2012*.

8 Opportunities to improve monitoring, evaluation and reporting

The Plan does not provide suitable, well-defined objectives, strategies and performance indicators to support MER. Only limited MER activities have been undertaken to date, which means there is minimal information available on the achievement of Plan outcomes, particularly to the public. For example, incomplete annual extraction data is undermining key outcomes of the Plan, including the determination and enforcement of environmental water requirements, the function of the LTAAEL, and the performance of water account management and trade provisions.

A comprehensive evidence base was not available when the Plan was developed and key processes such as the volumetric conversion of access licences was still underway. The monitoring activities and studies associated with the remaining identified knowledge gaps have not been undertaken. As a result, a lack of knowledge remains around some key aspects of the Plan. However, since this time, external studies have improved the evidence base for the Plan area more broadly, particularly on the interaction of surface and groundwater, end of system flow requirements, climate change and variability and predictions of future urban and industry requirements.

The replacement Plan should draw on existing studies and identify further studies required to improve the knowledge base (**Section 8.1**). A Plan-specific MER framework (**Section 8.2**) would assist DPIE-Water to better define outcomes and linked objectives, as well as undertake adaptive management over time. It will be important that these efforts are supported by the measurement of water usage through improved metering (**Section 8.3**). These actions will help strengthen the ability to implement adaptive management actions over the life of the Plan (**Section 8.5**).

8.1 Address gaps in the Plan's knowledge base

The NSW Government has acknowledged that research is needed to improve understanding of the impact of freshwater extraction on estuarine and coastal ecosystems, and that adaptive management systems are required.³²³ In addition, the Plan's background document recognises that Plan provisions were based only on available data and required further information to better assess risks:

'in twenty-eight of the Hunter unregulated water sources, there was a lack of adequate information to develop the final water sharing rules which could fully manage the risk to instream values and/or protect community dependencies'.³²⁴

The background document identified specific data collection, research and analysis to be undertaken during the life of the Plan to better understand these risks, inform amendment of Plan provisions and adaptive management actions, including:

³²³ NSW Government (n.d.) *No. 10 Freshwater flows to estuaries and coastal waters: Advice to Water Management Committees*. Available at:

http://www.water.nsw.gov.au/__data/assets/pdf_file/0005/548024/policy_advice_10-flows.pdf

³²⁴ DPI – Water (2016) *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Source – Background document for amended plan 2016*. Available at:

https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166849/hunter-unreg-alluvial-background.pdf

- monitoring to assess groundwater behaviour, extraction impacts and potential for impact on groundwater dependent ecosystems in various water sources
- studies of connectivity between groundwater and surface water in the Hunter Regulated River Alluvial Water Source
- studies to determine the appropriate location for salinity probes (or other relevant infrastructure), which would be used to assess the impact of tidal influences and salinity on users' ability to extract water in tidal pool water sources
- hydrological and socioeconomic studies to determine appropriate cease to pump levels and access rules in various water sources
- studies on how transfer rules influence the spread of access licences in various water sources
- further studies to identify and define endangered ecological communities, groundwater dependent ecosystems or aquatic environmental features and their water requirements
- assessment of Aboriginal cultural values and groundwater dependent cultural values
- an investigation into the Hunter, Paterson and Wallis estuaries, including economic valuation and hydraulic behaviour
- potential adaptation opportunities from the pilot Williams River Flow Accreditation Scheme.

The background document also noted that a state-wide research prospectus would be developed to identify any cross-cutting research needs and knowledge gaps (including collaborative research with external groups) across all macro water sharing plans. This appears to have been replaced with the *Water Science Strategy 2018-2023*. However, this document does not include clear timelines for the completion of studies.³²⁵

The Commission understands that despite these knowledge gaps being identified, only four Plan-required investigations have been undertaken. These include:

- the pilot Williams River Flow Accreditation Scheme (see **Section 9.4.1**)
- a hydrological assessment of the upper Isis River Water Source, which included investigation of the connectivity of surface water and groundwater
- installation of salinity probes and development of a hydrodynamic model (see **Section 5.2.6**)
- assessment of ecological and socioeconomic performance of environmental flows (note: this included all water sharing plans for the Hunter Valley, Central and Lower North Coast).³²⁶

The monitoring activities and studies associated with the remaining identified knowledge gaps have not been undertaken. There has been no associated consultation and no Plan-required amendments have occurred. As a result, a lack of knowledge remains around key aspects of the

³²⁵ NSW DPIE-Water (2018) *Strategy*. Available at: <https://www.industry.nsw.gov.au/water/science/strategy-collaboration/strategy>.

³²⁶ This assessment was undertaken in 2009-10 and the results were publicly reported. 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 assessment also included limited information on the Hunter unregulated and alluvial water sources, other than noting that further studies were planned. See: 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.

Plan and Plan area, including critical issues such as cultural values and cease to pump rules. As such, the Commission has a significant lack of confidence that the existing rules manage the risk to instream values and protect community dependencies.

Stakeholders also raised similar concerns regarding the Plan's evidence base, noting key actions needed to inform knowledge gaps including:

- further identification and assessment of high priority groundwater dependent ecosystems and their water requirements
- better understanding of tidal pools and flow requirements
- integration and modelling of the impacts of climate change, climate variation and drought on environmental, social and economic Plan outcomes
- improved data collection and monitoring of base flows and water usage
- further research on the connectivity of groundwater and surface water
- catchment-scale studies, including on sustainable catchment flows and requirements for catchment health
- improved monitoring of water quality, particularly salinity
- research and modelling on population increases, land use and industry change impacts
- studies on the cumulative impacts of mining
- identification of risks and mitigation measures to ensure future water security.³²⁷

The Commission recognises that DPIE-Water has been active in working on broader data collection and research programs, such as the identification of groundwater dependent ecosystems and cultural values and risks, as part processes for water resource plans in the Murray-Darling Basin and regional water strategies. However, there does not appear to be a systematic process for prioritising studies (whether research, monitoring or other investigation) or amendments.

The Commission notes that DPIE-Water has re-established a Water Sharing Plan Implementation Team that will focus on ensuring water sharing plan provisions are implemented and that internal and external roles, responsibilities and actions are clear.

In addition, there have been many external studies that build relevant evidence for the Plan area, including the Australian Government's Bioregional Assessment for the Hunter subregion and the *Greater Hunter Regional Water Strategy*, which have improved understanding of the interaction of surface and groundwater across the region, end of system flow requirements, and climate change and variability.

The replacement Plan should 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.

³²⁷ This provides a summary of key knowledge gaps noted in stakeholder submissions and interviews undertaken for this review.

8.2 Develop a Plan-specific MER framework

Consistent with requirements of the Act and the National Water Initiative,³²⁸ the need for robust MER frameworks was recognised when water sharing plans were developed.³²⁹ A MER framework is required to:

- measure the contribution of the Plan to achieving environmental, social and economic outcomes against clearly defined objectives
- provide clarity of roles and responsibilities, particularly where multiple parties are involved
- ensure that monitoring is designed to measure performance indicators and inform review of the Plan
- inform timely decision making, for example around environmental water provisions
- support ongoing adaptive management
- provide transparency for stakeholders, including public reporting of monitoring and evaluation and how it informs Plan review.

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

The Plan's background document indicates that DPIE-Water developed a MER framework for water sharing plans,³³⁰ with three main strategies for evaluating water sharing plans referenced in the Plan:

- assessment of performance indicators (using the Environmental Flows Monitoring and Modelling Program)³³¹
- implementation audit of plans (a draft implementation audit for period between 1 July 2009 and 30 June 2014 was prepared but has not been published)
- review of each plan at the end of its ten-year term (this review).

Performance indicators have been defined in the Plan with the intent of assessing whether the Plan was achieving key stated objectives – these included hydrological, economic, social, cultural and ecological objectives and indicators. However, there are several key limitations in the Plan that have restricted the ability to implement effective MER:

- environmental, social and economic outcomes are not clearly specified or prioritised in line with the Act (as outlined in **Section 1.1.1**)
- objectives do not clearly link with the outcomes, strategies and indicators

³²⁸ National Water Commission (2014) *The National Water Planning Report Card 2013 – page 65*. Available at: <https://www.agriculture.gov.au/sites/default/files/sitecollectiondocuments/water/2013-national-water-planning-report-card.pdf>.

³²⁹ 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.

³³⁰ DPI-Water (2016) *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Source – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166849/hunter-unreg-alluvial-background.pdf.

³³¹ This program aims to help make flow study results more transferable between water sources, and identify links between flow, hydraulics and ecological responses (*Ibid*).

- objectives, outcomes, strategies and indicators contain significant gaps, such as a lack of objectives related to water quality, harvestable rights, equitable water sharing or town water supply
- performance indicators are high-level and impractical to evaluate against – they are not designed to be SMART
- there is no overarching program, procedures or responsibilities to guide MER activities over the life of the Plan, to ensure enough data is collected to report on performance.

An implementation audit has also been undertaken, with one publicly released audit report card that covers Plan implementation during the period 1 July 2009 to 30 June 2014.³³² This focused primarily on the extent to which the Plan provisions had been applied and was not designed to report on the monitoring of performance indicators for social, environmental and economic objectives.

Apart from these activities, no further Plan-specific MER against the performance indicators or objectives has been made available, including on environmental water or the environmental condition of the water sources in the Plan area.³³³ As such, the extent to which outcomes are being achieved and the effectiveness of the Plan cannot be determined.

Stakeholder submissions have also raised concerns about the limited information available to demonstrate how rules are being implemented, whether the Plan objectives are being met and what, if any, adaptive management may be required:

'There has not been a report that I have seen, or been able to source, which gives specifics to the social, environmental or economic outcomes, nor their measurement. This makes it difficult to comment on these matters'.³³⁴

'There were key things that were supposed to have happened during the life of the plan but nothing publicly available to understand if these changes occurred ... Implementation and application of rules in plans are not transparent'.³³⁵

The lack of MER is a significant and recurring issue across NSW that has been repeatedly highlighted by stakeholders, in previous Commission reviews, as well as by the National Water Commission and in 2019 implementation audits for other water sharing plans.³³⁶ The Commission recognises the efforts of DPIE-Water to address these issues and improve MER across NSW, including:

- a scoping paper to set up a program framework for MER in unregulated rivers (2006)³³⁷

³³² DPI-Water (2014) *Hunter unregulated and alluvial water sharing plan audit report card – prepared for period between 1 July 2009 and 30 June 2014*, Sydney NSW. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0008/548027/wsp_audit_report_unregulated_rivers_july_09_june_12.pdf.

³³³ Interview: DPIE-Water, 30 October 2019.

³³⁴ Submission: Lower Hunter Water Users Association, received 25 October 2019.

³³⁵ Submission: Nature Conservation Council, received 24 October 2019.

³³⁶ 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>; DPIE-Water (2018) *Audits of water sharing plans under Section 44 of the Water Management Act 2000*. Available at: <https://www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/water-sharing-plan-audits>.

³³⁷ Chessman et al. (2006) *Program framework for ecological monitoring and reporting of water sharing plans for unregulated rivers: scoping paper*. Prepared for the Department of Natural Resources.

- initial irrigator surveys to monitor social and economic changes in water sharing plan areas (including the Hunter in 2009 and 2013)³³⁸
- *Guidelines for setting and evaluating plan objectives for water management (2018)*³³⁹
- work to improve objectives being undertaken as part of the water resource planning process in the Murray-Darling Basin, which will be expanded to improve the coastal unregulated water sharing plans in the future.³⁴⁰

DPIE-Water should continue to build on these state-wide efforts to improve MER across NSW.

The Commission also acknowledges that relevant MER is undertaken by many agencies (including DPIE-Water, DPIE-EES, WaterNSW, DPI-Fisheries, the Natural Resource Access Regulator and councils), which can create confusion and barriers to knowledge sharing. Clearly defining MER roles and responsibilities will help to address confusion, support coordination and identify opportunities for resource sharing across these agencies.

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.³⁴¹ This framework should be finalised by the end of 2020 and used to inform the replacement Plan. A MER framework for the Plan should:

- identify Plan-specific outcomes linked to clear objectives, strategies and performance indicators – this should include (but not be limited to) outcomes related to harvestable rights, urban water supply and salinity
- clearly define roles, responsibilities and timing for MER activities and adaptive management (including for metering, see **Section 8.2**)
- address performance indicators and inform evaluation and review of whether the Plan has achieved its objectives
- identify feasible and appropriate resourcing to support MER
- specify timely reporting requirements of the results of MER activities to support transparency, public awareness and compliance, and adaptive management – this should include both government requirements (for example, annual reports to the Minister against Plan objectives and outcomes) and public reporting requirements (for example, an online water reporting platform and dashboard)
- provide clear principles, processes and governance for adaptive management (see **Section 8.5**)
- identify and incorporate any relevant MER that has been completed or is underway outside of the Plan.

³³⁸ Available at:

www.water.nsw.gov.au/__data/assets/pdf_file/0010/548362/irrigators_survey_report_2013.pdf

³³⁹ These guidelines responded to the findings of earlier water sharing plan reviews 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. 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. See: NSW 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.

³⁴⁰ Advice received from DPIE-Water, February 2019.

³⁴¹ Personal communication, DPIE-Water, 28 February 2020

The Plan's MER activities should be supported by further development of DPIE-Water's state-wide standards and guidelines for MER, including a MER strategy for water planning and management in NSW by end of 2020.

8.3 Groundwater quality should be measured to manage salinity risk

The Plan includes a performance indicator to measure changes in their ecological condition where groundwater extraction is recognised as a primary risk.³⁴² While the provisions are considered sound, the replacement Plan should include more comprehensive strategies to measure groundwater quality and manage salinity risks.

Salinity is a significant environmental issue in the Hunter Valley.³⁴³ While evidence shows groundwater levels or electrical conductivity of groundwater have not been rising recently, increases in river salinity were linked to reduced river flows and increases in inflow of saline water from deeper strata.³⁴⁴ Salinity levels in rivers are also affected by rainfall, salts released by rock weathering and the discharge of saline water from power stations and mining activities into the river systems.³⁴⁵ In the regulated river these discharges are managed by the Hunter River Salinity Trading Scheme.³⁴⁶

Intense extraction from alluvial aquifers can lead to a decrease in groundwater quality. The Plan has a water quality indicator³⁴⁷ but water quality is not explicitly addressed further in the Plan. The potential risk from salinity to groundwater and surface water should be assessed and the replacement Plan should include clear water quality objectives, performance indicators and management strategies. The Plan should be amended to include provisions for water quality (Part 12) The replacement Plan could draw on examples of provisions from the draft *Water Sharing Plan for the Namoi Alluvial Groundwater Sources*,³⁴⁸ which includes:

- an objective 'to protect the extent and condition of high priority groundwater dependent ecosystems'³⁴⁹ and 'to contribute to the maintenance of groundwater salinity levels (total dissolved solids) within ranges that maintain a beneficial use category that supports groundwater dependent business'³⁵⁰
- a strategy to 'manage the construction and use of water supply works to minimise impacts on high priority groundwater dependent ecosystems and groundwater quality'
- performance indicators on 'the extent and recorded condition of high priority groundwater dependent ecosystems'; 'the recorded condition of target populations of

³⁴² Clause 11 of the Plan.

³⁴³ NSW Environment Protection Authority (2013) *Hunter Catchment Salinity Assessment*. Available at: <https://www.epa.nsw.gov.au/-/media/7AFF4DA407D44002AB6DE0027271FFB5.ashx>.

³⁴⁴ Kellett, J.R., Williams, B.G. and Ward, J.K., (1989) *Hydrogeochemistry of the upper Hunter River valley, New South Wales*. Bureau of Mineral Resources; Biswas, F. (2010) *Hydrology of the Upper Hunter Catchment*. PhD Thesis. Australian National University. Available at: <https://digitalcollections.anu.edu.au/handle/1885/8760>.

³⁴⁵ NSW Environment Protection Authority (2013) *Hunter Catchment Salinity Assessment*. Available at: <https://www.epa.nsw.gov.au/-/media/7AFF4DA407D44002AB6DE0027271FFB5.ashx>.

³⁴⁶ NSW Environment Protection Authority (2018) *Hunter River Salinity Trading Scheme*. Available at: <https://www.epa.nsw.gov.au/licensing-and-regulation/licensing/environment-protection-licences/emissions-trading/hunter-river-salinity-trading-scheme>

³⁴⁷ Clause 12 (d) of the Plan.

³⁴⁸ DPI-Water (2010) *Draft Water Sharing Plan for the Namoi Alluvial Groundwater Sources*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0019/230806/schedule-a-draft-wsp-namoi-alluvial-gw.pdf.

³⁴⁹ Clause 9 of the draft *Water Sharing Plan for the Namoi Alluvial Groundwater Sources*.

³⁵⁰ Clause 5 of the draft *Water Sharing Plan for the Namoi Alluvial Groundwater Sources*.

high priority groundwater dependent native vegetation'; and 'the recorded values of salinity levels (total dissolved solids)'.

Groundwater quality monitoring is limited in the Plan area, both spatially and temporally. Stakeholders raised concerns regarding the lack of monitoring of groundwater extraction.³⁵¹ Additional sampling and analysis of bores should be included in the MER program for the replacement Plan to assess trends in water quality across the Plan area.

Salinity should be included as a key factor in groundwater assessments and monitoring of alluvial water quality, particularly in areas where there is extraction of groundwater from fractured rock, such as mining operations, to identify changes between aquifers and potential impacts on surface water quality.

8.4 Remaining metering risks should be assessed

Consistent metering is important to facilitate compliance and trade, as well as to inform the MER framework. Relative to other regions, this Plan area has a high proportion of water extraction that is metered or measured as part of its allocation to Hunter Water and other large users such as AGL and mining operations.

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 2018.³⁵² The replacement Plan should be consistent with this framework.

Delivered in a staged process, this framework will improve the standard and coverage of non-urban water meters. Coastal regions are required to comply by 1 December 2023.³⁵³ The framework includes requirements to meter all pumps 100 millimetres or larger, as well as all spear points. The Commission was unable to obtain accurate data on the proportion of these pumps in the Plan area but considers that these changes are likely to capture a significant proportion of currently unmetered users.³⁵⁴

In developing the replacement Plan, the residual risks associated with remaining unmetered users to implementing Plan provisions, including compliance with LTAAELs, AWDs and cease to pump rules, should be assessed. 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.³⁵⁵ In considering additional controls, it is important to balance the cost of implementation to government and existing users with the risk to the resource of over extraction.

³⁵¹ Submissions: Individual, received 16 September 2019; Individual, received 25 October 2019; Baerami Creek Water Users Association, received 8 November 2019.

³⁵² NSW Government (2018) *NSW non-urban water metering policy*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0017/205442/NSW-non-urban-water-metering-policy.pdf.

³⁵³ Except for pumps 500 millimetres or larger, which are required to comply by 1 December 2019. Source: Department of Industry – 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>.

³⁵⁴ Information provided by WaterNSW on pump capacity data for the Plan area, received via email 7 February 2019.

³⁵⁵ 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.

8.5 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, access rules, record keeping or water supply works standards and provisions for alluvial aquifers downstream of the tidal limit.³⁵⁶ These provisions were intended to allow the Plan to be improved over time and incorporate new information, such as MER outputs, updated mapping and modelling. However, the Plan and associated documents do not provide details as to how this adaptive process will work or be implemented, particularly for the environmental component

Regular assessment of Plan performance and adaptive management activities are particularly important for the Plan due to:

- the limitations in the evidence base when the Plan rules were set (**Section 8.1**)
- the value of water to the region's industries, which are expected to become more diversified over the next Plan period (see **Section 2.10**)
- predicted socioeconomic trends over the Plan period and associated risks, including increases in population and housing (both total number and concentration) and declines in rural areas (**Section 2.8**)
- predicted climate changes, particularly increasing and intensified droughts (**Section 2.4**)

However, it appears that the general provisions for amendments within the Plan to address such risks are not leading to effective adaptation and improvement during the life of the Plan.

The Commission is not aware of any instances where planned amendments as a result of studies identified at Plan commencement have been made. This includes instances where the studies and associated consultation has confirmed and endorsed the amendments, as in the case of revised environmental flows from Chichester Dam (see **Section 5.2.4**). Other 'unplanned' amendments have been made to the Plan to accommodate industry-specific exemptions to water sharing rules (see **Section 5.2.6**).

Stakeholders also noted that the Plan has not adequately applied the principles of adaptive management, for example in responding to socioeconomic risks one submission noted:

'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'.³⁵⁷

Stakeholders considered that water sharing plans reflect a one-size-fits-all model that is more relevant to inland areas. Adaptive management is key to supporting a more tailored approach to local water sharing plan areas.

DPIE-Water advised the Commission that several amendments are being considered as part of the replacement Plan.³⁵⁸ These include:

³⁵⁶ Part 15 of the Plan.

³⁵⁷ Submission: NSW Irrigators Council, received 25 October 2019; interview with Hunter Local Land Services, 6 November 2019.

³⁵⁸ DPIE-Water, personal communication, 1 October 2019.

- adjusting access rules for users downstream of improved environmental releases to maintain equivalent access conditions
- consulting water users in the lower Williams River to ensure the new environmental flows from Chichester Dam and accompanying access rules will result in comparable access conditions to the 2009 water sharing plan rules
- establishing improved access rules and a separate management zone to improve water access during extended dry periods, as identified in the Upper Isis River Water Source hydrological assessment (and potential changes to mitigate impacts to downstream users from this)
- developing new cease to pump rules and management zones in the upper Williams River and Upper Wollombi Brook water sources to improve access to water for basic landholder rights
- amending access rules in the Upper Wollombi Brook, Isis River and the Williams River water sources, as previously identified in the Plan.

Considering the notable lack of implementation of previous planned amendments, it is important that the replacement Plan better support adaptive management throughout the life of the Plan in response to new information being generated.³⁵⁹

The Commission recommends that the replacement Plan and Plan-specific MER framework (see **Section 8.2**) identify appropriate principles, governance arrangements, responsibilities and timeframes for adaptation that underpin a robust adaptive management process.

³⁵⁹ 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:

- NARCLiM and Bureau of Meteorology/CSIRO updates to climate change predictions and modelling
- environmental and flow studies relevant to the catchment
- High Ecological Value Aquatic Ecosystems Assessment mapping
- Bureau of Meteorology's Groundwater Dependent Ecosystems Atlas
- local government and other relevant agencies' drought management plans
- land-use data including industry and housing statistics to inform modelling
- current hydrological datasets
- ecological datasets (for example, SEED Portal, Directory of Important Wetlands, threatened species)
- riverine and estuarine condition studies
- Saving our Species program threatened species data
- socio-economic modelling and impact assessments.

8.6 Recommendations

In order to strengthen MER for the Plan, the Commission makes the following recommendations (Table 19) and suggested actions (Table 20).

Table 18: Recommendations for DPIE-Water to improve MER

Recommendations	
23	The replacement Plan by 2022 should be informed by the completion of relevant studies identified at Plan commencement and existing studies and should identify further studies required to improve the knowledge base.
24*	<p>A Plan-specific MER framework should be developed for the replacement Plan that reflects state-wide guidelines (see Suggested action C). The framework should:</p> <ul style="list-style-type: none"> a) ensure objectives and performance indicators are included for all key outcomes of the Plan not currently accounted for, such as harvestable rights (see Recommendation 10), equitable water sharing (see Recommendation 15), urban water supply and salinity b) clearly define outcomes linked to specific, measurable, achievable, relevant and time-bound (SMART) objectives, strategies and performance indicators that align with the water management principles and priorities as set out in the Act c) set clear governance arrangements that define roles, responsibilities and timing for MER activities and adaptive management (including for metering) d) be supported by feasible and appropriate resourcing to support MER e) set timely reporting requirements of the results of MER activities to support transparency, public awareness and compliance, and adaptive management – this should include both government requirements (for example, annual reports to the Minister responsible for the Plan against Plan objectives and outcomes) and public reporting requirements (for example, an online water reporting platform and dashboard) f) include clear processes and governance for adaptive management g) incorporate relevant MER data that has been completed or is underway outside of the Plan.
25*	As part of the Plan replacement in 2022, assess the residual risk to implementing Plan provisions (including LTAAELs and AWDs) from users that are not captured under the NSW Government’s metering framework.
26*	As part of the Plan replacement, include principles, governance arrangements, responsibilities and timeframes to ensure the effective implementation of the Plan, including its adaptive management.

Table 19: Suggested actions for improving MER

Suggested actions	
B*	By the end of 2020, identify state-wide research needs and knowledge gaps across all water sharing plans and address these gaps in collaboration with other organisations and research institutions.
C*	Continue to develop state-wide MER, including a MER strategy for water planning and management in NSW by end of 2020 which considers key gaps at the state scale (for example, MER standards, reporting requirements, adaptive management principles and processes, resourcing and support).

9 Opportunities to improve Plan development and implementation

As part of this review, the Commission has identified several opportunities to improve Plan development and implementation. The Commission recommends that DPIE-Water:

- improve stakeholder understanding of the Plan through simple and consistent language, improved modes of communication, and targeted education
- strengthen implementation and enforcement of the Plan through clear governance, including well-defined roles, responsibilities and timeframes for actions
- strengthen existing processes for stakeholder engagement developed as part of the water reform action plan,³⁶⁰ including a Plan-specific stakeholder engagement plan – this needs to specify appropriate forums for engagement, such as stakeholder advisory panels, which include a range of stakeholders with diverse interests and localised knowledge of water
- adopt an integrated catchment management approach and supporting tools.

9.1 Strengthen communication and education

There is a general lack of stakeholder understanding of the Plan and the extent to which provisions and planned actions have been implemented. This creates opportunities for community mistrust, tension and non-compliance.

Key measures that could improve Plan implementation include:

- using simple and concise language and structure, including for objectives and outcomes
- improved communication methods
- targeted education initiatives.

While recognising that the Plan is a legal document, the replacement Plan needs to be accessible and easily understood. Many stakeholders felt that the Plan language could be simplified to improve their understanding of the Plan,³⁶¹ as well as compliance with its provisions.³⁶² As one stakeholder submission described, the replacement plan rules, objectives and outcomes should be *'simple, concise and comprehensible to a broad range of stakeholders, to enhance stakeholder support and compliance'*.³⁶³ A simplified, plain English approach will help improve clarity and transparency of the Plan and increase stakeholder understanding.

Guidance documents, fact sheets and similar supporting materials can also be used to effectively communicate Plan elements. Aspects identified by stakeholders that could be better communicated included basic landholder rights, water licence conditions (for example, cease to pump levels) and harvestable rights:

³⁶⁰ DoI-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.

³⁶¹ Interview: Natural Resources Access Regulator, 22 October 2019.

³⁶² Interview: NSW Irrigators Council, 21 October 2019.

³⁶³ Submission: NSW Irrigators Council, received 25 October 2019.

'People need to know the rules that govern them ... Short and simple information packs describing entitlements and prohibited actions needs to be posted to the community'.³⁶⁴

'There is a lack of any guidance or governance of water use in the valley. This would include further clarity on limits to pumping rights'.³⁶⁵

In lieu of clear communication and guidance, many water users are making assumptions around the Plan provisions or providing their own interpretation and advice through water user associations: *'The vast majority of people want to comply and do the right thing ... People need to be educated ... It shouldn't be water users doing the department's job to educate the users'.³⁶⁶*

The Commission notes that DPIE-Water has recently provided summaries and updates on water sharing plans on its website and WaterNSW has provided public information on licences, conditions and applications. Stakeholders consulted as part of this review described these communication efforts as effective and wanted to see these expanded.

It may also be useful to provide detailed education programs on more complex issues. Stakeholders consider education is essential to reduce uncertainty and change water use behaviours: *'[DPIE-Water] need to work on behavioural perceptions with a view to changing them'.³⁶⁷* Domestic and stock rights and new metering requirements were identified by stakeholders as possible areas for further education by DPIE-Water and the Natural Resources Access Regulator, respectively.

Targeted education activities should occur during Plan development and over the life of the Plan to reaffirm water users' awareness of Plan provisions, as well as improve broader understanding of water sharing principles.

9.2 Implement clear and consistent governance

There are several instances in which the Plan and supporting actions were not implemented. Studies and planned changes to cease to pump rules are examples where the lack of implementation creates misunderstanding and tensions among water users, as described here:

'The WSP has failed to provide certainty to both the environment and water users because of the many amendment provisions and failure to transparently implement rule changes in most of the water sources'.³⁶⁸

It is important that planned actions are supported with clear governance – particularly well-defined roles, responsibilities and timeframes for actions – these are lacking in the current Plan provisions. Water sharing plan audits undertaken in 2019 support this finding and consistently recommend that roles and procedures are documented so that provisions are fully and consistently implemented and there is accountability.³⁶⁹

³⁶⁴ Submission: Individual, received 25 October 2019.

³⁶⁵ Submission: Congewai Valley Landcare, received 21 October 2019.

³⁶⁶ Interview: Hunter Valley Water Users' Association, 21 October 2019.

³⁶⁷ Interview with Hunter Local Land Services, 6 November 2019.

³⁶⁸ Interview: Nature Conservation Council, 21 October 2019.

³⁶⁹ Alluvium and Vista Advisory (2019) *Audit of the Water Sharing Plan for the Barwon-Darling Unregulated and Alluvial Water Sources 2012*. Report 6 by Alluvium Consulting Australia (Canberra and Melbourne) and Vista Advisory (Canberra) for the NSW Department of Planning, Industry and Environment, Sydney.

In addition, stakeholders considered that governance of water is confusing with *'all the different and changing agencies that water users have to deal with. There are too many plus a lack of communication and flexibility to communicate between the agencies.'*³⁷⁰ While these institutional arrangements can be difficult to control for, a well-defined and Plan-specific MER framework can help to ensure that governance is clearly defined and that change is adequately accommodated through transferable responsibilities and risks (see **Section 8.2**).

Transparent governance is important to help reduce uncertainty, and importantly, rebuild stakeholder trust in water governance in NSW. Given the updated governance and review arrangements between DPIE-Water, WaterNSW, the Natural Resources Access Regulator and the Commission are still relatively new, it is important that the roles of each of these bodies is clearly stated and integrated in all revised water sharing plans and associated documentation.

9.3 Develop community relationships and capacity

Improved communication of the Plan needs to be sustained through effective stakeholder engagement. Stakeholders felt that the NSW Government should lead more active and inclusive engagement on water.³⁷¹ For instance, some felt that the Plan does not adequately reflect the full range of industry stakeholders with water interests and considered that the *'department needs to better understand the mix of industries'*.³⁷² DPIE-Water was seen to rely on passive forms of communication, such as letters and notifications on its website, leaving some water users feeling *'isolated'*.³⁷³

The lack of stakeholder advisory panels or similar engagement mechanisms in the Plan area was raised across all coastal water sharing plans and was seen to contribute to poor stakeholder relationships:

*'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.'*³⁷⁴

*'Coastal people in particular can't have input ... [they're] left in the dark.'*³⁷⁵

The lack of strong stakeholder relationships can compound issues in times of stress, such as the drought conditions experienced since 2017, where tensions and resistance among water users in the Plan area has been intensified.³⁷⁶ Regular and meaningful engagement with key stakeholders provides a foundation for communicating Plan provisions, intended actions, adjustments and adaptive management throughout Plan implementation.³⁷⁷

The Commission acknowledges – as do many stakeholders – that DPIE-Water has limited resources to undertake a high level of active engagement, particularly in unregulated plans that

³⁷⁰ Interview: Hunter Valley Water Users' Association, 21 October 2019.

³⁷¹ Submission: NSW Irrigators Council, received 25 October 2019.

³⁷² Interview: Hunter Community Environment Centre, 22 October 2019.

³⁷³ Interview: Barrington Water Users Association, 25 October 2019.

³⁷⁴ Submission: NSW Irrigators Council, received 25 October 2019.

³⁷⁵ Interview: Hunter Valley Water Users' Association, 21 October 2019.

³⁷⁶ Submissions raised issues regarding the impacts of drought on community well-being and considered that reviewing the water sharing plan rules during these times creates additional stress and increases scepticism of government. Submissions: Individual, received 28 October 2019; Individual, received 16 September 2019; Individual, received 22 October 2019; Upper Hunter and Tributaries Water Users Association, 20 October 2019.

³⁷⁷ Interview: DPI-Fisheries, 24 October 2019.

have a high number of water sources, but the benefits of these approaches in achieving the Plan's objectives should not be underestimated. Strengthening the stakeholder engagement strategy developed as part of the water reform action plan would be useful to target DPIE-Water's efforts, particularly in coastal areas, to effectively use resources and maximise the benefits of stakeholder engagement.

9.4 Adopt an integrated catchment management approach

Applying the principles of integrated catchment management is an effective way of considering risks and information outside of Plan – both as part of Plan development and during implementation.

Firstly, an integrated approach can help to build and sustain an effective evidence base for the Plan. The review identified several instances where the Plan needs to better accommodate and align with key policies, plans and risks outside the Plan. This includes alignment with proximate water sharing plans, other water-related plans such as the *Greater Hunter Regional Water Strategy* (see **Section 3.2**), and information on broader climatic, social and economic trends and risks in the region. Taking this wider view of the context for water sharing can help to build a strong evidence base for Plan development.

Secondly, integrated catchment management focuses on increasing overall resilience at the landscape scale, which is particularly important as climate change places additional pressures on environmental, social and economic outcomes. There are key issues for water sharing that are more effectively addressed at the landscape scale including:

- **improving water quality and aquatic habitat** – through salinity and water quality monitoring and management, refuge restoration, removal of barriers to fish passage, reinstatement of instream woody habitats
- **protecting and restoring riparian zones** – minimising over-clearing and poor management practices, implementing buffer zones, riparian fencing and native revegetation
- **addressing regional pressures and risks** – feral weeds and animals, increasing population, infrastructure, industry and housing development, drought and climate change.³⁷⁸

These issues can be better accommodated in the replacement Plan by drawing on the wide range of available evidence during Plan development and applying adaptive management throughout implementation.

Finally, integrated catchment management offers opportunities for collaboration and leveraging off other investments. Agencies such as Local Land Services provide integrated approaches to regional natural resource management, among other roles in primary production, biosecurity, and emergency management.³⁷⁹ In the Plan area, Hunter Local Land Services has a number of initiatives underway that could help support the Plan remake and implementation.³⁸⁰ For

³⁷⁸ 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/10440HUNTCEstuarine.pdf>.

³⁷⁹ Local Land Services (2016) *State Strategic Plan 2016-2026*. Available at: <https://www.lls.nsw.gov.au>

³⁸⁰ In addition to this example, Hunter Local Land Services also work with other agencies and through funding support from the Marine Estate Management Authority (MEMA) to: provide grants to incentivise landholders to improve water quality through bank stability, instream works and track maintenance; work with local

example, a Hunter River Management Plan and associated decision support tool uses key objective indicators of ecological outcomes to make decisions around interventions in the landscape context for riparian management and water quality.³⁸¹ A whole-of-catchment hydrological model will be developed to further support landscape scale decision making that can help in planning water sharing provisions in the region.

9.4.1 Reconsider a flow accreditation scheme

A 'flow accreditation scheme' is one example of supporting integrated catchment management. The Williams River Accreditation Scheme was included in the Plan, as part of a pilot in the Williams River Management Zone that had an option for expansion into other water sources in the future.³⁸² The scheme permits variable cease to pump levels for accredited farmers. Participation is voluntary and requirements for accreditation include implementing on-farm works (for example, fencing), equipment updates and practice change. Benefits to accredited farmers include access to flows in the very low flow class, enabling them to access water after non-accredited users must cease pumping. Catchment benefits include improved water quality, albeit with potentially reduced stream flows.

The Commission understands that the scheme has not been further implemented after the pilot ended. Stakeholders consulted as part of this review have expressed interest in accreditation schemes to incentivise riparian management. As one stakeholder described:

'Some landholders were quite proud of what they'd done, and said it made their farm easier to manage. They could see the obvious environmental benefits for the river...the accreditation scheme was a good spin off for social licence to operate and makes farming easier'.³⁸³

The Commission recommends that the accreditation scheme is reconsidered as part of the Plan remake as one tool for supporting integrated catchment management. Clear and evidence-based accreditation requirements would need to be included to ensure that the scheme is effective in providing for whole-of-catchment outcomes.

councils on sediment targets in priority catchments; and developing riparian mapping and trend analysis over 25 years in the Manning Great Lakes and Hunter regions (on all streams above 5th order, in one kilometre datasets) (Interview: Hunter Local Land Services, 6 November 2019).

³⁸¹ Interview: Hunter Local Land Services, 6 November 2019.

³⁸² Part 3, Clause 17.

³⁸³ Interview: Local Land Services, 6 November 2019.

9.5 Suggested actions

The Commission suggests several actions to strengthen Plan development and implementation (see **Table 21**).

Table 20: Suggested actions for DPIE-Water

Suggested actions	
D*	Adopt state-wide processes that support the Plan remake and implementation by: <ul style="list-style-type: none">a) enhancing communication of water sharing plans through active, simple, and consistent language and modes of communicationb) improving implementation and enforcement using clear and consistent governance, roles and responsibilities, and timelines.
E*	As part of the Plan replacement, develop well-evidenced and resourced processes for stakeholder engagement in the Plan area, including appropriate forums for engagement, such as stakeholder advisory panels that include a range of stakeholders with diverse interests and localised knowledge of water. This should be part of a strengthened state-wide stakeholder engagement strategy.
F*	Before the Plan replacement in 2022, adopt integrated catchment management approaches that support the replacement and implementation.