NSW GOVERNMENT

Natural Resources Commission

Final report

Review of the water sharing plans for the Richmond and Tweed unregulated and alluvial water sources

February 2021

Acknowledgement of Country

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

In the Tweed and Richmond areas, the Commission pays its respects to the Bunjulung and Githabul 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.

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Acronyms and units of measurement

Act	the *Water Management Act 2000* (NSW)
AWD	Available water determination
Commission	the Natural Resources Commission
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
ECA	Environmental Contingency Allowance
GL	Gigalitre (unit of volume equivalent to one billion (1×10^9) litres
GRP	Gross Regional Product
GSP	Gross State Product
HEVAE	High Ecological Values Aquatic Ecosystem
LALC	Local Aboriginal Land Council
LGA	Local government area
LTAAEL	Long-term annual average extraction limit
MER	Monitoring, evaluation and reporting
ML	Megalitre (unit of volume equivalent to one million (1×10^6) litres
NARCliM	NSW and ACT Regional Climate Modelling Project
North Coast Coastal Sands Plan	*Water Sharing Plan for the North Coast Coastal Sands Groundwater Sources 2016*
NRAR	Natural Resource Access Regulator
NSW	New South Wales
Ppt	Parts per thousand
Richmond Plan	*Water Sharing Plan for the Richmond River Area Unregulated, Regulated and Alluvial Water Sources 2010*
SEPP	State Environmental Planning Policy

R/ SA	Recommendation/ Suggested action
SMART	Specific, measurable, achievable, relevant and time-bound
Tweed Plan	*Water Sharing Plan for the Tweed River Area Unregulated and Alluvial Water Sources 2010*
The Plans	The Richmond and Tweed Plans

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Executive summary

The Natural Resources Commission (the Commission) has reviewed the *Water Sharing Plan for the Richmond River Area Unregulated, Regulated and Alluvial Water Sources 2010* (the Richmond Plan) and the *Water Sharing Plan for the Tweed River Area Unregulated and Alluvial Water Sources 2010* (the Tweed Plan) in the NSW Far North Coast region,[1] as required under Section 43A of the *Water Management Act 2000* (the Act).

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

The Plans should be extended and then replaced to address key risks

Following comprehensive analysis and public consultation, the Commission identified a range of issues that justify replacing the Plans. The Plans are not currently equipped to effectively manage risks associated with climate change and population growth. While town water supply needs have largely been met under the current Plans, projected population growth and climate change will place pressure on the region's water resources and their users, including town water supply.

There has been substantial investment in strategic planning to address these issues, including the NSW Government's draft *Far North Coast Regional Water Strategy*, Rous County Council's *Future Water Project 2060* and Tweed Shire Council's assessment of options to secure town water supply. Several initiatives being explored may proceed during the next plan period. The Commission recommends replacing the Plans after a two-year extension to align with these initiatives. Replacing the Plans will also allow for other key issues to be addressed, the most critical being:

- **improving understanding of environmental values and strengthening their protection –** given future risks, key provisions around the protection of low flows, environmental releases, the Richmond tidal pool and threatened native fish must be reviewed to ensure environmental values are protected
- **improving knowledge and management of surface-groundwater connectivity –** current provisions do not consider that some water sources are highly connected, resulting in risks to environmental and economic outcomes, as well as equity issues
- **improving outcomes for Aboriginal people –** Aboriginal values are not adequately considered, and Aboriginal licence categories inhibit any meaningful water use
- **addressing inaccuracies, errors and confusing rules**, particularly in the Richmond plan, which cause compliance issues, barriers to trade and environmental impacts.

Recommendation (R) 1

The Plans should be:

a) extended for a further two years until 30 June 2023, with priority actions progressed in the interim, to allow time to complete data collection, analysis and modelling and to consider regional water planning processes currently underway.

b) replaced by 1 July 2023, supported by the completion of the recommendations of this review.

[1] The term 'the Plans' is used when speaking broadly across the Richmond and Tweed Plans.

Population growth and climate change risk town water supply

Town water supply needs were largely met under the current Plans, although drought did affect water availability. Given future risks, the Plans should align with other planning processes to secure future town water supply. Increased entitlements for local water utilities may be needed in the replacement Tweed Plan for the villages of Tyalgum and Uki, but this requires more rigorous assessment. The Commission was advised by the Department of Planning, Industry and Environment - Water (DPIE-Water) that local water utility licences will be reviewed in accordance with the Act and a process to consider adjustments to licence shares is in development. The long-term sustainability of raising share components would need to be considered in setting sustainable, numeric long-term average annual extraction limits (LTAAELs).

Provisions in the Plans prevent in-stream dams on third order or greater streams that have high instream values. The Commission supports the retention of these provisions in line with the Act, which are intended to protect environmental values, noting that they should reflect the outcomes of the latest mapping and analysis by DPIE-Water of high ecological value aquatic ecosystems (HEVAE). This mapping classified several water sources in the plan areas as having high to very high instream values. Consideration should also be given to the protection of waterways based on their importance as key fish habitat to native fish populations.

R 2 – Richmond Plan	By 1 July 2023, to ensure town water supply risks are managed while improving environmental outcomes in the Richmond Plan area, DPIE-Water should: a) maintain the prohibition on in-stream dams on third order and greater streams consistent with the Act and the latest HEVAE mapping of instream values and take into consideration key fish habitat mapping b) consider the outcomes of investigations undertaken as part of the *Far North Coast Regional Water Strategy* and *Rous Future Water Project 2060* in drafting Plan provisions. *See also **Recommendation 6** regarding environmental outcomes.*
R 3 – Tweed Plan	By 1 July 2023, to ensure town water supply risks are managed while maintaining environmental outcomes in the Tweed Plan, DPIE-Water should: a) consider the outcomes of investigations undertaken as part of the Bray Park Weir Tidal Inundation Project (including fishway design) and Clarrie Hall Dam augmentation environmental impact statement b) review demand forecast and other studies from Tweed Shire Council to determine if the share component of the local water utility access licences requires an increase to meet the forecast demand for Tyalgum and Uki, or whether this could be met through other measures c) retain provisions that support the prohibition of in-stream dams on third order and greater streams (including in the Byrrill Creek Water Source) and ensure these provisions reflect the latest HEVAE mapping and key fish habitat mapping.

Extraction is not effectively managed

The Plans lack fixed sustainable, numeric LTAAELs, meaning that extraction cannot be effectively managed to protect environmental needs. LTAAELs should also consider risks from growing basic landholder rights extraction and increasing demand for local water utility extraction associated with population growth.

Recent Plan audits found that available water determinations (AWDs) have not been used to ensure compliance with LTAAELs – their primary purpose in unregulated rivers. AWDs could also be explored as a tool to better manage extraction during drought, particularly where there is natural storage capacity, such as in the Richmond tidal pool and alluvial aquifers.

R 4 – Both Plans	By 1 July 2023, to ensure all extraction under the Plans is managed to protect, preserve and maintain the water sources, aquifer integrity and dependant ecosystems, DPIE-Water should: a) establish and publish fixed, numeric values for LTAAELs, ensuring they are based on best available information, including ecological requirements, an accurate estimate of basic landholder rights and climate change b) investigate the feasibility of setting separate LTAAELs based on high flow and low flow c) undertake regular LTAAEL compliance assessments, ensuring they are underpinned by clear, publicly available procedures requiring consideration of basic landholder rights estimates that are no more than five years old when assessing compliance with extraction limits.
R 5 – Both Plans	By 1 July 2023, DPIE-Water should include rules as necessary following consideration of how AWDs can be used to manage extraction during drought in the Richmond tidal pool and alluvial aquifers including under predicted climate change. This should consider the latest understanding of climate risk based on improved climate data and modelling undertaken to inform the *Far North Coast Regional Water Strategy*.
Suggested Action (SA) A – Both Plans	Finalise the reasonable use guidelines for domestic and stock use by 1 July 2022 and include the agreed standards as part of the replacement Plans.

The Plans contain insufficient environmental protections

Environmental water management in the Richmond catchment lacks governance and environmental flow rules for local water utility storages are absent from the Richmond Plan. Environmental releases from major storages are inadequate and required environmental contingency allowance (ECA) releases from Toonumbar Dam were not made. Visible flows were delivered downstream of Toonumbar Dam and likely provided some benefits for the environment and domestic and stock users, but a lack of monitoring makes it difficult to assess the extent of these benefits. Operational rules in the Tweed Plan require environmental releases from Clarrie Hall Dam and Bray Park Weir via the fishway. These have occurred but there are opportunities to improve outcomes through the review of environmental flows as part of the proposed raising of Clarrie Hall Dam and upgrade of Bray Park Weir.

There is limited evidence that the provisions to protect the Richmond tidal pool, low flows and threatened native fish are effective. Some rules are impractical to follow and do not reflect best available information. The Plans lack rules to mitigate the risk of disturbing acid sulfate soils, which may lead to water quality impacts.

R 6 – Richmond Plan	By 1 July 2023, to improve environmental flow rules in the Richmond Plan for infrastructure where environmental releases are currently not provided for or are suboptimal, DPIE-Water should: a) use best available information to determine suitable, outcomes-focused environmental flow regimes for all dams and weirs, and ensure these are reflected in Plan rules and licence conditions b) establish an Environmental Flows Reference Group[2] within a year of Plan commencement to strengthen governance, strategic planning, and oversight of environmental flow releases across the Richmond catchment to improve environmental outcome. The group as a minimum should include representatives from DPIE-Water, DPIE-Environment, Energy and Science (EES), the Department of Primary Industries (DPI)-Fisheries, WaterNSW, Rous County Council and local community. The group should engage with the governance model adopted as part of the Richmond Coastal Management Program to ensure there are shared objectives and outcomes (where appropriate). c) review the gauging network and ensure there is accurate monitoring of inflows and outflows from storages within the catchment, including Emigrant Dam Creek as a priority and include appropriate flow reference points in the Plan.
R 7 – Tweed Plan	By 1 July 2023, to improve the management of environmental releases under the Tweed Plan, DPIE-Water should: a) amend the Plan if necessary to allow changes to operational rules for Clarrie Hall Dam and Bray Park Weir based on the outcomes of investigations as part of the proposed augmentation of Clarrie Hall Dam, Bray Park Weir Tidal Protection Project (including fishway design) and *Far North Coast Regional Water Strategy*. b) implement revised environmental flow rules for Clarrie Hall Dam and Bray Park Weir (via fishway) based on best available information regarding the water requirements of key environmental assets, including, but not limited to native fish.
R 8 – Richmond Plan	By 1 July 2023, to improve the management of the Richmond tidal pool, DPIE-Water should: a) analyse salinity data from continuous monitoring stations and run scenarios through updated Richmond hydrodynamic and salinity models to better understand the impacts of extraction on the movement of the salt-freshwater interface

[2] To replace the Environmental Contingency Allowance Operations Advisory Committee.

	b) review available evidence to better understand instream values and their environmental needs and the impacts of extraction c) refine cease to pump thresholds and pumping restrictions based on (a) and (b) to better protect environmental values d) include town water supply access rules for the Wilsons River Water Source and ensure these align with access rules for other users e) review the trading rules for the tidal pool, including the trade-in limit of 2000 megalitres (ML) and the validity of the management zones approach where no trades are allowed between management zones.
R 9 – Both Plans	By 1 July 2023, to reduce pressure on low flows, DPIE-Water should: a) determine if amendments to Plan provisions are required to encourage high flow conversions, where appropriate, by: i. determining a target for high flow conversions that could achieve a material benefit through destressing the low flow regime, but not compromising high flow dependent values ii. assessing barriers and drivers for uptake of high flow conversion b) improve understanding of the environmental flow requirements of priority water dependent species in unregulated water sources, including low flow requirements – cease to pump rules should be reviewed based on this information and updated flow data c) review the adequacy of existing river gauge network and whether additional gauges are required to reduce the number of water sources with a 'no visible flow' rule.
R 10 – Both Plans	By 1 July 2023, to improve outcomes for native fish, DPIE-Water should collaborate with DPI-Fisheries to: a) improve understanding of native fish populations and whether recruitment is occurring through targeted surveys of eastern freshwater cod (Richmond Plan area), southern purple-spotted gudgeon and Oxleyan pygmy perch (both plan areas) b) update Plan provisions based on best available information, including fish flow requirements (including to achieve fish passage), key fish habitat mapping, new listings of threatened native fish and DPI-Fisheries' threatened species distribution mapping c) include amendment provisions in the replacement Plans allowing updates to Plan rules based on new data for a broad range of water-dependent species.
R 11 – Both Plans	By 1 July 2023, to improve mitigation of acid sulfate soil risks, DPIE-Water should: a) include a definition and provisions to manage the risk of disturbance of acid sulfate soils, consistent with those in the *Water Sharing Plan for the Macleay Unregulated and Alluvial Water Sources 2016* b) ensure Plans cross-reference online Acid Sulfate Soil Risk Maps so water users can identify at risk areas.
SA B – Both Plans	Support complementary measures such as riparian rehabilitation, streambank stabilisation and improved fish passage. Ensure these measures are considered in an integrated way with the Plans.
SA C – Richmond Plan	By the end of 2022, DPIE-Water should collaborate with WaterNSW to adopt a simpler notification system (consider text message) for Richmond tidal pool users to inform them about when pumping restrictions and cease to pump conditions are in place.
SA D – Richmond Plan	Tweed Shire Council should establish a Technical Working Group to advise on options for a new fishway at Bray Park Weir and associated operating requirements to deliver better environmental outcomes for native fish.

Spatial variation in values and connectivity is not considered

The Plans need to improve the protection of highly connected surface-groundwater systems, drawing on best available information and undertaking additional studies where appropriate. Water access rules should be revised to protect highly connected systems beyond 40 metres. Groundwater dependent ecosystems (GDEs) should be reviewed to reflect best available data and clarify links to the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016*.

Consideration of socioeconomic values needs to better reflect the full range of industries in the North Coast, industry changes and associated water requirements, including tourism and aquaculture. Trade rules are complex and difficult to understand and implement. Mapping errors and administrative arrangements limit dealings for trade. Barriers to trade should be reviewed and addressed to improve economic outcomes.

R 12 – Both Plans	By 1 July 2023, to improve the management of connectivity, DPIE-Water should: a) draw on best available information and conduct relevant studies to identify highly connected systems, including but not limited to the relationship between Alstonville Plateau groundwater and base flow in connected waterways in the Richmond Plan area b) revise access rules accordingly to include new bore licences beyond 40 metres from the high bank of a river for areas that are identified as highly connected in 12(a) and stage access rules for existing bores c) include comprehensive definitions for surface-groundwater connectivity in the Plan dictionaries.
R 13 – Both Plans	By 1 July 2023, to support economic outcomes, while protecting high-value aquatic ecosystems, DPIE-Water should use best available evidence to review trade arrangements under the Plans, including: a) considering latest HEVAE mapping and risk assessments b) assessing the full range of economic benefits and impacts of water extraction and the importance of river health to industries and supporting a range of ecosystem services such as tourism, recreation and community activities c) reviewing and addressing trade barriers, such as mapping errors (noting that environmental outcomes must be maintained) d) working with WaterNSW to address ambiguity in trade rules and improve administrative arrangements to enable timely trades e) amending Plan rules, where necessary, to address any changes to classifications.
R 14 – Both Plans	By 1 July 2023, to improve the management of GDEs, DPIE-Water should: a) map and ground-truth the presence and extent of GDEs, including estuarine and coastal ecosystems and define their groundwater requirements b) clearly define groundwater terms and their relevance to the Plans, including GDE priority and types (including high-priority GDEs) c) review setback distances for work near identified GDEs and standardise them based on the *NSW Aquifer Interference Policy 2012* and more stringent setback distances in the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater* d) clarify the extent to which Tuckean Swamp is managed by the Richmond Plan and ensure provisions reflect the requirements in the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016*, where supported by best available information.

The Plans do not support outcomes for Aboriginal people

The Plans do not fully recognise all native title claims and Indigenous Land Use Agreements. State-wide issues relating to Aboriginal water values, rights and uses (marked with *) remain. The lack of Aboriginal stakeholder engagement during Plan development and implementation means that Aboriginal water values are poorly understood and protected in the Plan areas. There is a significant need to focus on opportunities to develop and resource proactive involvement of Aboriginal people in coastal water planning and management. There was no evidence of Aboriginal specific purpose licences being applied for or issued under the Plans. The complexity and limitations on these licences inhibit any meaningful uses by Aboriginal people.

R 15 – Both Plans	Amend the Richmond and Tweed Plans to reflect all current native title determinations and claimants and Indigenous Land Use Agreement holders comprehensively and reflect this consistently across both Plans.
R 16	Reserve unallocated water for Aboriginal specific licences or other Aboriginal water access options, before being offered to the market on commercial terms.
R 17* - Both Plans	Finalise a NSW Aboriginal Water Strategy in 2021 to provide consistent, transparent guidelines and resourcing for Aboriginal water management across NSW, comprising the following at a minimum: a) **Improve recognition of native title** by including a common provision to undertake preliminary amendments to a plan within six months of a native title determination or other agreement that includes water allocation. b) **Allow additional time to undertake detailed engagement** with Traditional Owners, make water allocations and final plan amendments; considering native title claims proactively as part of water sharing planning. c) **Identify Aboriginal water values and uses, objectives and outcomes** by undertaking extensive engagement with Aboriginal stakeholders in all plan areas; prioritising allocations to protect values; adopting cultural landscape-scale principles; integrating identified values into ongoing water planning and management. **Co-design Aboriginal specific licences or other water access options** with key Aboriginal stakeholders that meet identified needs for a range of cultural, environmental, social and economic uses.

Plan MER and implementation requires attention and investment

There are several issues relating to the development and implementation of the Plans (many of which are consistent with state-wide issues) – marked with (*). As with other water sharing plans, there is limited monitoring, evaluation and reporting (MER), making it difficult to measure effectiveness and allow for adaptive management to improve outcomes. DPIE-Water is currently addressing gaps in MER for coastal and inland water sharing plans, including funding strategic monitoring and implementation projects. Such improvements are an important step and critical to ensuring accountability for the replacement Plans.

There is broad stakeholder support for a rollout of metering to support compliance and improved stakeholder engagement and capacity building to better understand Plan requirements and strengthen accountability.

R 18* - Both Plans	By 1 July 2023, to improve transparency and support the achievement of outcomes in line with the water management principles and priorities of the Act, DPIE-Water should strengthen MER, including: a) completing studies required to improve the knowledge base and for adaptive management b) developing Plan-specific publicly available MER frameworks consistent with the coastal and state-wide guidelines. The framework should include linked and SMART objectives, strategies and performance indicators, define roles and responsibilities, set timely public reporting requirements and include adaptive management processes.
SA G* – Both Plans	Continue to develop state-wide evaluation framework and monitoring plan, considering and addressing key gaps and prioritising MER activities based on values and risk. The framework, monitoring plans and reporting should be publicly available to improve transparency.
SA H* – Both Plans	As part of the Plan replacement in 2023, 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.
SA I* – Both Plans	DPIE-Water should adopt state-wide processes that support the Plan remake and implementation by: a) enhancing communication of water sharing plans through active, simple, and consistent language and modes of communication b) improving implementation using clear and consistent governance, roles and responsibilities, and timelines.
SA J* – Both Plans	As part of the Plan replacement, DPIE-Water should develop well-evidenced and resourced processes for stakeholder engagement in the Plan area. This should be part of a strengthened state-wide stakeholder engagement strategy.
SA K* – Both Plans	By 1 July 2023, DPIE-Water should adopt integrated catchment management approaches that support the Plans' replacement and implementation.

1 Review background

1.1 Water sharing plans and the Commission's role

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

The Richmond and Tweed Plans commenced on 17 December 2010 and are due for extension or replacement on 1 July 2021.

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

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

The Commission may recommend extending or replacing the Plans depending on its review findings. Section 43A(3A) of the Act requires the Commission to consider some potential compensation requirements resulting from recommended changes to a Plan.[3] Under the Act, compensation is payable by the state to access licence holders only in certain circumstances[4] where water allocations under a water sharing plan are reduced.

The Commission must also consider the water management principles,[5] including the water sharing principles, when reviewing the Plans. The Act is clear that water sharing is not about balancing uses and values – it is about first providing for the environment and second recognising basic landholder rights above other uses. It specifies that the:

a) sharing of water from a water source must protect the water source and its dependent ecosystems, and

b) sharing of water from a water source must protect basic landholder rights, and

c) sharing or extraction of water under any other right must not prejudice the principles set out in paragraphs (a) and (b).[6]

Further, the water management principles should be prioritised in the order that they are set out above.[7] Water sharing plans must be based on evidence to achieve these outcomes.

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

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

5 Section 5 of the Act.

6 Section 5(3) of the Act.

7 Section 9(1) of the Act.

For reference, the roles of the various NSW water management agencies are summarised in **Figure 1**.

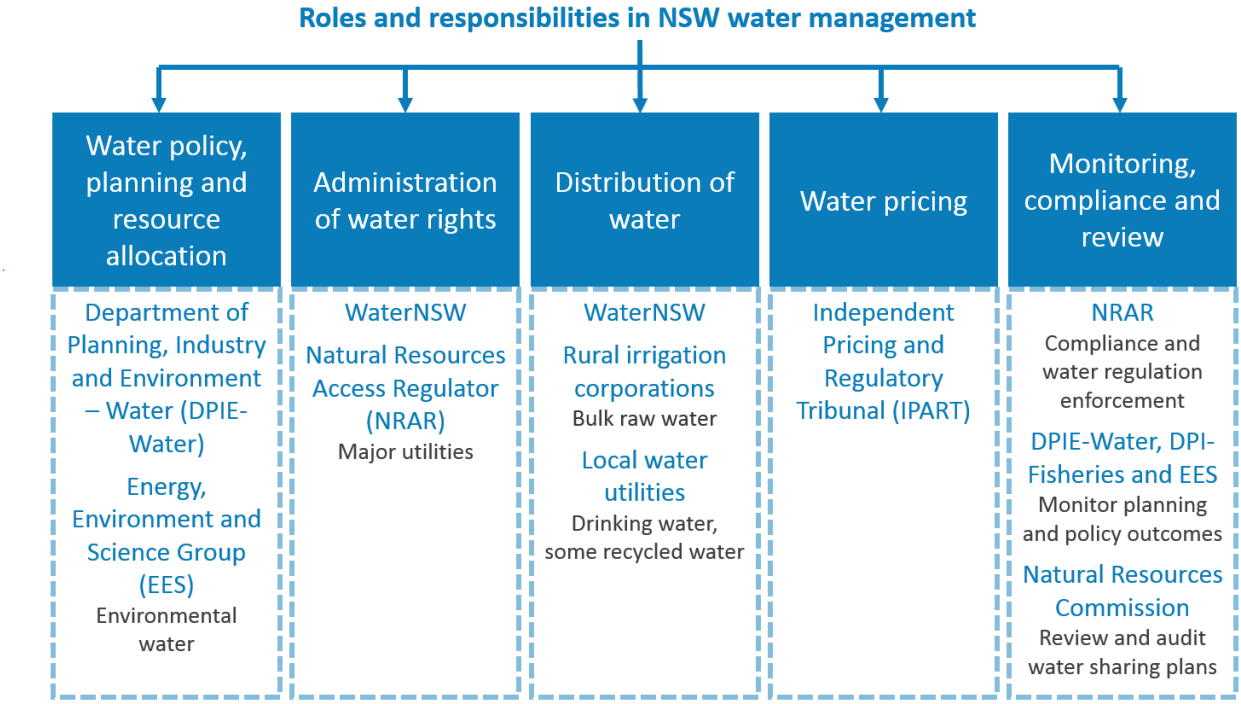

Figure 1: Roles and responsibilities in rural and regional water management[8]

1.2 Review approach

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

- **Consultation** – with government agencies, community and industry organisations.
- **Consultation with Aboriginal stakeholders** – the Commission provided the opportunity for input from Traditional Owner groups, Local Aboriginal Land Councils (LALCs) and relevant government agency staff in the Plan areas. The Commission undertakes ongoing consultation on Aboriginal water issues at a state level with NSW Aboriginal Land Council, Aboriginal Affairs NSW, Indigenous Land and Sea Corporation and Aboriginal staff in relevant NSW Government agencies.
- **Document review** – the Commission reviewed the Plans and their background documents. 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 and agreements that apply to the Plan areas.
- **Technical advice** – consultants provided expert analysis key aspects of the Plan including groundwater and environmental objectives, the effectiveness of Plan provisions and opportunities for improvement.
- **Submissions** – the Commission called for and considered public submissions via letters and calls to key stakeholders and advertising on the Commission's website. Stakeholders

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

were asked to respond to the following five questions to assess the contribution of the Plans to environmental, social, cultural and economic outcomes:

- To what extent do you feel the Plan has contributed to social outcomes?
- To what extent do you feel the Plan has contributed to environmental outcomes?
- To what extent do you feel the Plan has contributed to economic outcomes?
- To what extent do you feel the Plan has contributed to meeting its objectives?
- What changes do you feel are needed to the Plan to improve outcomes?

The Commission received 17 submissions on the Richmond Plan and 32 on the Tweed Plan. Non-confidential submissions are published on the Commission's website.[9]

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

The lack of clearly linked objectives, strategies and indicators, and limited MER made it difficult to determine the Plans' performance. This report presents the Commission's findings using the best available evidence.

9 Natural Resources Commission (2021) *2019-2020 Water sharing plan reviews*. Available at: https://www.nrc.nsw.gov.au/2019-2020-wsp-reviews.

2 Plan areas

This chapter gives an overview of the Richmond and Tweed Plan areas and their water-dependent environmental, social and economic values. The Plan areas are in the Far North Coast region of NSW. They manage water supporting significant environmental values, including world and national heritage areas. The Plan areas, including their waterways, are recognised for their natural beauty, which contributes to high rates of tourism. Agriculture, forestry and fishing and manufacturing are other key water dependent industries.

Aboriginal people hold profound knowledge, understanding, obligation and custodianship of these areas, often expressed as connection to Country. This is embedded and alive in the Plan areas, demonstrated in a diverse range of culturally significant water values.

The Plan areas face significant risks to water resources from population growth and climate change.

2.1 Richmond Plan area and water sources

The Richmond Plan covers the coastal Richmond River and Evans River catchments on the Far North Coast region of NSW (**Figure 2**). The Richmond Plan area covers around 6,900 square kilometres, with the Evans River Catchment covering only 62 square kilometres of this.[10] Major towns include Ballina, Lismore, Byron, Casino, Evans Head and Kyogle.[11] The Richmond Plan covers 24 water sources within three extraction management units:

- Richmond River Extraction Management Unit – covering twenty-two unregulated surface water and alluvial groundwater sources in the Richmond River Catchment
- Richmond Regulated Extraction Management Unit – covering the Richmond Regulated Water Source, regulated through releases from Toonumbar Dam and including a number of general security and high security water users that order water through WaterNSW, and domestic and stock users that are serviced through visible flows from the dam
- Evans River Catchment Extraction Management Unit – covering the unregulated surface water and alluvial groundwater sources of the Evans River Catchment (see **Appendix B**).[12]

The Coopers Creek Water Source, previously managed under a separate water sharing plan, was included in the Richmond Plan via in an amendment in 2016.

10 DPI-Water (2016) *Water Sharing Plan for the Richmond River Unregulated, Regulated and Alluvial Water Sources – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166876/richmond-river-unreg-reg-alluvial-background.pdf.

11 .id Demographic Resources (2020) *Community profiles for Kyogle Council, Richmond Valley Council, Lismore City Council, Ballina Shire Council and Byron Shire Council*. Available at: https://profile.id.com.au/.

12 DPI-Water (2016) *Water Sharing Plan for the Richmond River Unregulated, Regulated and Alluvial Water Sources – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166876/richmond-river-unreg-reg-alluvial-background.pdf.

The main waterway is the Richmond River, with an annual average flow of 1,920,000 ML, noting that there is significant annual variability.[13] The Richmond River floodplain covers 1,000 square kilometres between Evans Head and Cape Byron.[14]

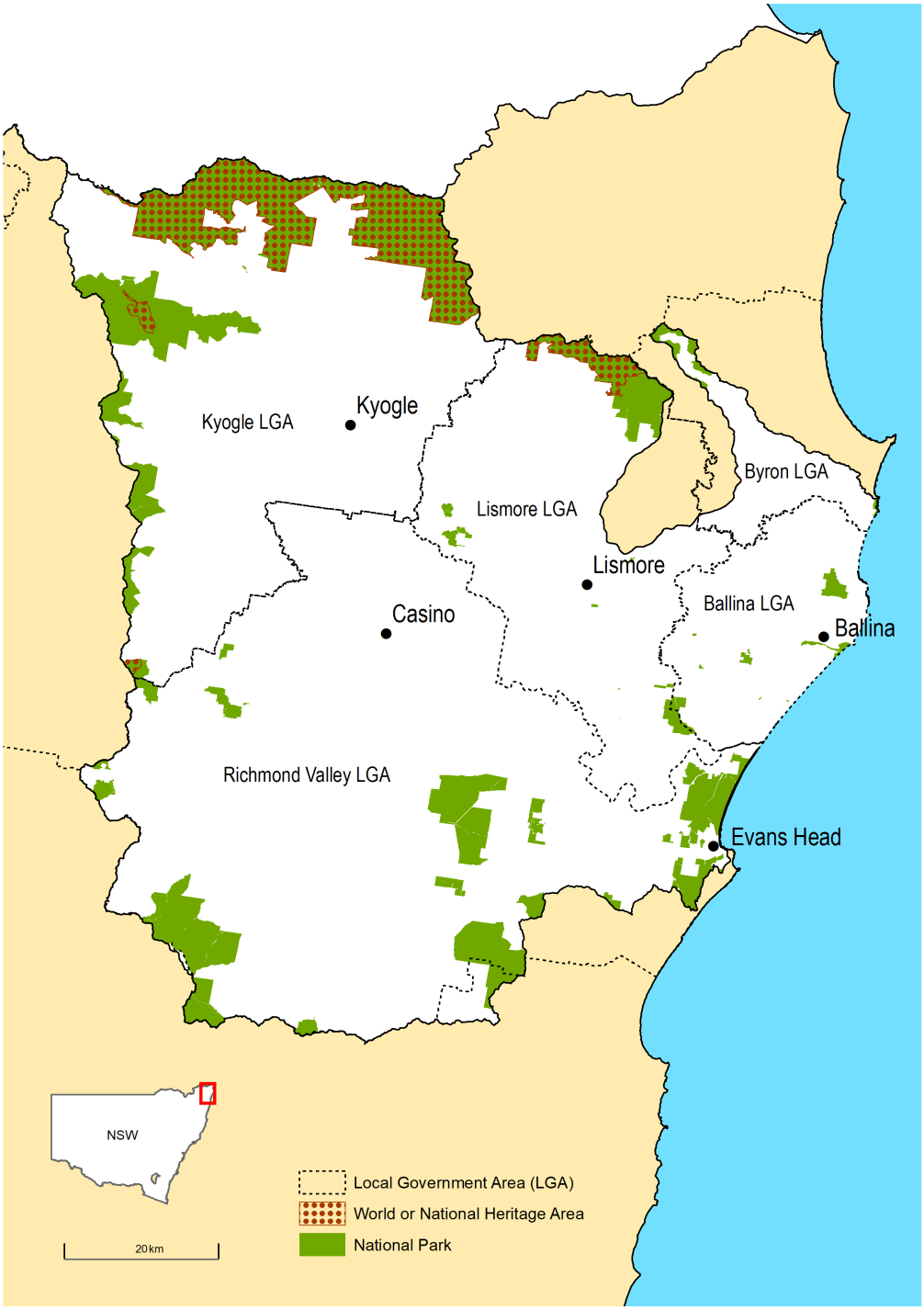

Figure 2: Map showing Richmond Plan area, local government areas (LGAs), national parks and heritage areas[15]

13 *Ibid*.

14 DPI-Water (2016) *Water Sharing Plan for the Richmond River Unregulated, Regulated and Alluvial Water Sources – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166876/richmond-river-unreg-reg-alluvial-background.pdf.

15 Map developed by the Commission from publicly available NSW and Australian government data.

The Richmond tidal pool covers approximately one third of the total 19 square kilometres of waterways and has a strong tidal influence (up to 90 kilometres upstream). Inflows to the tidal pool vary significantly, impacting salinity.[16] However, it is typically fresh enough to permit agricultural use.[17]

There are several groundwater sources in the region, including the New England Fractured Rocks aquifers, Clarence Morton Basin porous rocks, the North Coast Fractured Rocks, unconsolidated alluvial aquifers and the Richmond Coastal Sands.[18] The aquifers of the New England Fold Belt Fractured Rocks, Clarence Morton Basin and the North Coast Fractured Rocks are managed through the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016.* The *Water Sharing Plan for the North Coast Coastal Sands Groundwater Sources 2016* covers the Richmond coastal sand aquifers.[19] Alluvial aquifers are covered by the Richmond Plan. The Richmond Coastal Sands and upriver alluvials have significant connection.[20]

Major storages in the Richmond River catchment include the WaterNSW-operated Toonumbar Dam (11,000 ML) and local water utility storages including Rocky Creek Dam (14,000 ML) and Emigrant Creek Dam (820 ML), which are the responsibility of Rous County Council. There are also a series of weirs in the catchment and extensive drainage works on the Richmond River floodplain.[21]

Table 1 shows the breakdown of licence entitlements for the Richmond Plan as at December 2020, totalling 103,198.5 ML per year.[22] Unregulated river access licences hold the largest entitlement at 67,697 ML, or 66 percent of the total entitlement. Local water utility licences represent the second largest portion of entitlement at 22,174 ML per year, or 21 percent of total licence entitlement.

16 DPI-Water (2016) *Water Sharing Plan for the Richmond River Unregulated, Regulated and Alluvial Water Sources – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166876/richmond-river-unreg-reg-alluvial-background.pdf.

17 *Ibid*.

18 *Ibid*.

19 *Ibid*.

20 *Ibid*.

21 *Ibid*.

22 Data provided by WaterNSW from its Water Licensing System, accessed 3 December 2020. Note the total surface water entitlement recorded in the Richmond Plan in 2016 is slightly higher, at 103,428 ML.

Table 1: Breakdown of entitlement by licence category as at December 2020 for the Richmond Plan area (based on the WaterNSW Water Licensing System)

Category	Entitlement (ML)	Number of licences
Licenced entitlement		
Unregulated river	67,697	1,227
Local water utility	22,174	17
Aquifer	3,674	111
Regulated river		
Regulated river (general security)	9,531	61
Regulated river (high security)	123	7
Total licence entitlement	103,199	
Domestic and stock[23]	4,026	2

2.2 Tweed Plan area and water sources

The Tweed Plan covers around 1,325 square kilometres in the Tweed River catchment and the smaller coastal catchments of Cudgen, Cudgera and Mooball creeks on the Far North Coast of NSW (**Figure 3**).[24] Major towns include Tweed Heads, Murwillumbah and the coastal villages of Kingscliff, Hastings Point and Pottsville.[25]

The Tweed Plan comprises 31 unregulated and alluvial water sources within three extraction management units:

- Tweed River Catchment Extraction Management Unit – covering twenty-four water sources in the Tweed River Catchment
- Clothiers Creek Catchment Extraction Management Unit – covering two water sources in the Clothiers Creek Catchment
- Burringbar River Catchment Extraction Management Unit – covering five water sources in the Burringbar River Catchment (see **Appendix B**).

The major waterway is the Tweed River, which has an annual average flow of around 365,000 ML and is fed by the Tweed, Oxley and Rous River branches and smaller creeks.[26] There is a large floodplain below Murwillumbah and several estuarine creeks feeding into the system, which have a tidal influence up to around 5 kilometres upstream of Murwillumbah.[27] Extensive drainage and flood modifications have been developed on the floodplain of the Tweed River,

23 Note these are domestic and stock water access licence shares not basic landholder rights and include subcategories of town water supply.
24 NSW Office of Water (2010) *Water Sharing Plan, Tweed River Area Unregulated and Alluvial Water Sources Background document*. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0004/549418/wsp_tweed_river_background.pdf.
25 *Ibid*.
26 *Ibid*.
27 *Ibid*.

including levees and floodgates to support agricultural uses of sugar cane cropping and grazing.[28]

There are two major water storages on the Tweed River; Clarrie Hall Dam (15,000 ML) and Bray Park Weir (520 ML).[29] Groundwater sources in the Tweed Plan area include upriver alluvial aquifers (which are highly connected to their parent streams) and coastal floodplain alluvial aquifers (which have less interchange between the surface and groundwater).[30]

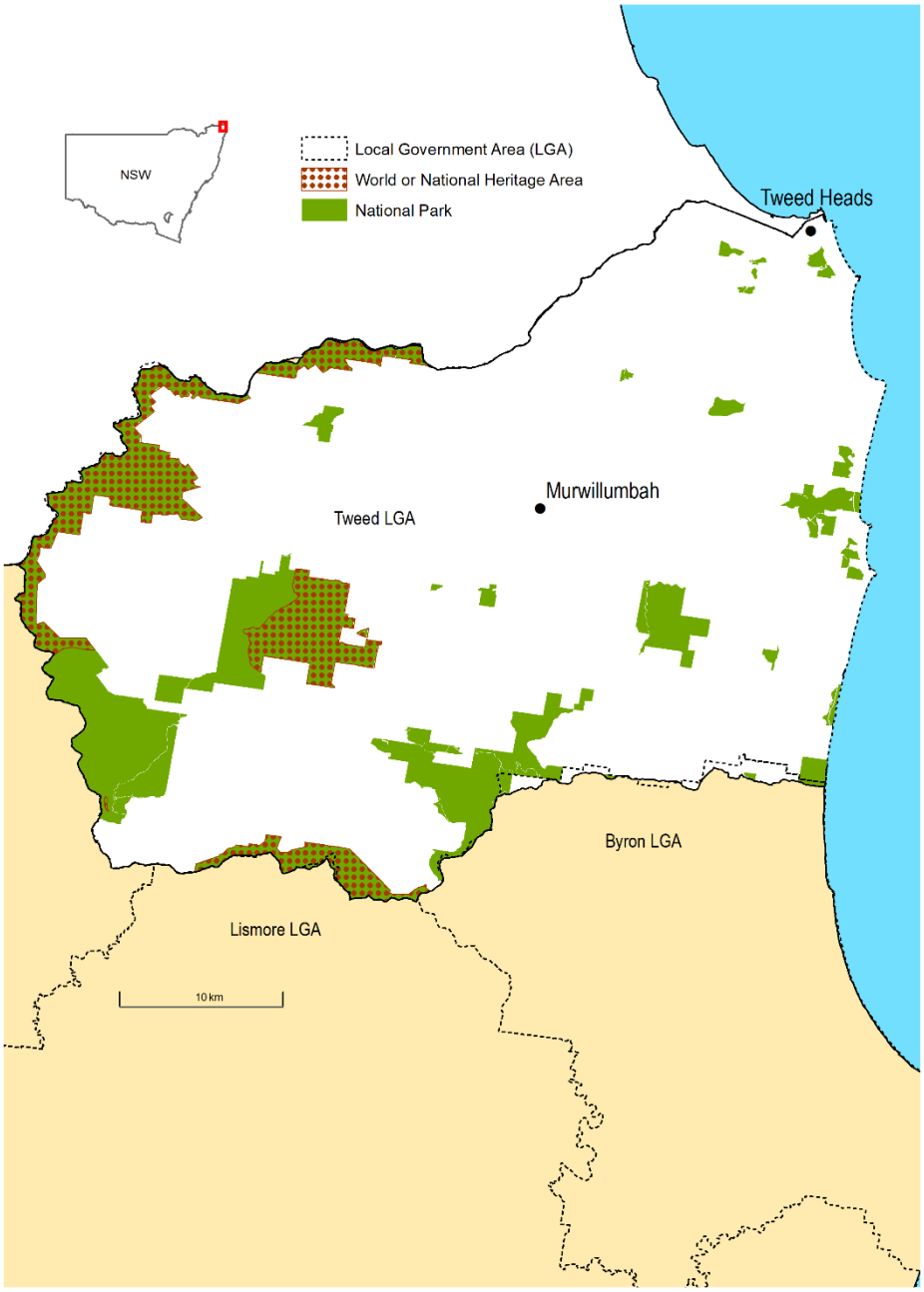

Figure 3: Map showing Tweed Plan area, including LGAs, national parks and heritage areas

28 Hydrosphere Consulting (2018) *Tweed River Estuary: Coastal Management Program 2018-2028*, pre-exhibition draft for review. Available at: https://www.yoursaytweed.com.au/tweed-river-estuary.

29 NSW Office of Water (2010) *Water Sharing Plan, Tweed River Area Unregulated and Alluvial Water Sources Background document*. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0004/549418/wsp_tweed_river_background.pdf.

30 *Ibid*.

Table 2 shows the breakdown of the licence entitlements for the Tweed Plan as at December 2020, totalling 35,157 ML per year. Utility access licences hold the largest volume of entitlement at 27,613 ML, or 79 percent of the total licence entitlement. Unregulated river access licences represent the second largest portion of entitlement at 7,094 ML, or 20 percent of total licence entitlement.[31]

Table 2: Breakdown of entitlement by licence category as at December 2020 for the Tweed Plan area (based on the WaterNSW Water Licensing System)

Category	Entitlement (ML)	Number of licences
Licenced entitlement		
Local water utility	27,613	3
Unregulated river	7,094	241
Aquifer	450	21
Total licence entitlement	35,157	
Basic landholder rights		
Domestic and stock	186	37

2.3 Environmental context

The Richmond and Tweed catchments form part of the North Coast Bioregion. The Richmond-Tweed subregion is characterised by subtropical and warm temperate rainforests and wet sclerophyll forest.[32] The catchments support high terrestrial and aquatic biodiversity on public and private land, including many endemic species, and threatened species and communities.

Protected areas are primarily located in upland reaches and along the coastal fringe, including the World Heritage-listed Wollumbin National Park, Mebbin National Park and Bunjulung and Broadwater national parks. There is also a network of estuary and broadwater features that include the Cobaki and Terranora Broadwaters, and the Tweed River and Richmond River estuaries. Along the coastal strip, numerous wetlands are protected under the State Environment Planning Policy 14 (SEPP 14) for Coastal Wetlands. The Richmond River floodplain includes one high priority groundwater dependent ecosystem, Tuckean Swamp,[33] which includes the Tuckean Nature Reserve.

31 Data provided by WaterNSW from its Water Licensing System, accessed 3 December 2020.

32 DPIE (2016) *North Coast – subregions*. Available at: environment.nsw.gov.au/bioregions/NorthCoast-Subregions.htm.

33 DPI-Water (2016) *Water Sharing Plan for the Richmond River Unregulated, Regulated and Alluvial Water Sources – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166876/richmond-river-unreg-reg-alluvial-background.pdf.

Many waterways in the Plan areas have been mapped as key fish habitat.[34] DPI-Fisheries' Threatened Species Distribution Mapping[35] indicates that the southern purple-spotted gudgeon (*Mogurnda adspersaI*) and Oxleyan pygmy perch (*Nannoperca oxleyana*) potentially occur in both Plan areas and the eastern freshwater cod (*Maccullochella ikei*) in the Richmond Plan.[36]

When the Plans were developed, seven water sources in the Richmond Plan area and two in the Tweed Plan area were classified as having high instream values based on the macro water sharing plan classification process. This was based on the presence of threatened species, high diversity, minimal disturbance to in-stream condition, recreational value, and significant areas of national parks (see **Appendix B**).[37]

Mapping of instream values was recently updated by DPIE-Water. The new HEVAE consequence assessment process uses a decision tree approach to evaluate river reach outcomes for HEVAE criteria and associated instream value and catchment value attributes in a water source. The new approach includes five categories (very low, low, medium, high and very high) compared to the former approach, which had three (low, medium and high). Based on data provided by DPIE-Water, the new approach identified four water sources in the Richmond Plan area with a high HEVAE outcome and nine as very high. For the Tweed Plan area, four water sources had a high HEVAE outcome and five were very high. These new ratings may have implications for access rules and dealing rules.

Significant areas have been cleared for agriculture and impacted by urbanisation. Most notably, the Richmond floodplain in the Tuckean area has been extensively modified with drainage works to allow for agriculture. These changes led to exposure of acid sulfate soils, acidic discharge and blackwater events which have resulted in several fish kills in the Richmond River. Poor water quality in and downstream of the Tuckean area associated with acidic discharge remains an ongoing issue.[38]

The modified condition of the Richmond and Tweed catchments is reflected in water quality results. An Ecohealth assessment of the Richmond Catchment in 2015 rated the overall catchment condition as poor.[39] The upland reaches were rated to be in better condition than downstream reaches as they had better water quality and more intact riparian vegetation. In the lower reaches clearing for agriculture, animal grazing in watercourses, slumping banks, increased turbidity, floodplain draining and leaching of nutrients led to the overall poor rating of the catchment. The tidal pool upstream of Woodburn had the poorest rating with very low dissolved oxygen, high turbidity and increased nutrient load. Water quality in the Tweed Shire

34 DPI-Fisheries (2007) *Key fish habitat mapping*. Available at: https://www.dpi.nsw.gov.au/fishing/habitat/publications/pubs/key-fish-habitat-maps.

35 DPI-Fisheries (2016) *Threatened species distribution maps*. Available at: https://www.dpi.nsw.gov.au/fishing/threatened-species/threatened-species-distributions-in-nsw.

36 *Ibid*.

37 DPI-Water (2016) *Water Sharing Plan for the Richmond River Unregulated, Regulated and Alluvial Water Sources – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166876/richmond-river-unreg-reg-alluvial-background.pdf.

38 Rayner, D.S., Harrison, A.J. and Glamour, W.C. (2020) *Tuckean swamp hydrologic options study*. Available at: https://ozfish.org.au/wp-content/uploads/2020/03/WRL-TR2019-21-FINAL-DRAFT-JANUARY-2020_COMPRESSED.pdf.

39 Ryder, D., Mika, S., Richardson, M., Schmidt, J. and Fitzgibbon, B. (2015) *Richmond Ecohealth Project 2014: Assessment of River and Estuarine Condition. Final Technical Report*. Available at: https://www.ipart.nsw.gov.au/files/5d55f177-6785-4e2b-abea-4314fb4be5eb/Attachment-12.1-UNE-Richmond-Catchment-Ecohealth-Report.pdf.

ranges from poor at Rous River estuary, Cobaki and Terranora tributaries to good in the Cobaki, Terranora Broadwaters and lower Tweed estuary.[40]

The Commission notes that multiple factors contribute to poor water quality and a range of interventions are required to help improve river condition.

2.4 Climate

The Richmond and Tweed catchments have a subtropical climate with significantly variable rainfall across the catchments from east to west. Rainfall records in the region are among the highest in NSW, with average annual rainfall ranging from 1,800 millimetres at Byron Bay to 1,200 millimetres near Kyogle.[41]

Rainfall is highly seasonal. A significant wet season occurs in summer months with the potential for flood events.[42] Thunderstorms are common in summer months, and every few years the Northern Rivers experiences cyclonic rain depressions, sometimes with associated flooding.[43] For example, in March 2017 ex-tropical cyclone Debbie resulted in heavy rain across the Tweed Valley, causing major flooding and the declaration of the Tweed Shire as a natural disaster area.[44]

There is variability in streamflow between wet and dry years, with streams experiencing low to no flows during extended dry periods. The Plan areas have experienced several droughts, including a severe drought in 1902, 2002-2003 and most recently 2019 to early 2020. The 2002-2003 drought caused increased salinity in the Richmond tidal pool which threatened town water supply.[45] This occurred again in early 2020, when cease to pump conditions were in place. The recent drought, which affected both the Richmond and Tweed catchments led to water restrictions for some communities. These restrictions were eased after a significant rainfall event in February 2020.

New datasets and climate modelling undertaken to inform the *Far North Coast Regional Water Strategy* indicates that the Far North Coast region (including the Richmond and Tweed catchments), is likely to experience:[46]

- changes in rainfall patterns – increasing in spring and decreasing in autumn and winter

40 Tweed Shire Council (2019) *Tweed River Report*. Available at: https://www.tweed.nsw.gov.au/Download.aspx?Path=/Controls/Environment/Documents/Tweed%20River%20Report%202019.pdf.

41 DPIE (2020) *Draft Regional Water Strategy – Far North Coast Strategy October 2020*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0017/329012/draft-rws-fnc-strategy.pdf.

42 DPI-Water (2016) *Water Sharing Plan for the Richmond River Unregulated, Regulated and Alluvial Water Sources – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166876/richmond-river-unreg-reg-alluvial-background.pdf.

43 *Ibid*.

44 Tweed Shire Council (2017) *March 2017 Flood*. Available at: https://www.tweed.nsw.gov.au/Documents/Flooding/TSC08183_Report_to_Council_March_2017_Flood.pdf.

45 DPI-Water (2016) *Water Sharing Plan for the Richmond River Unregulated, Regulated and Alluvial Water Sources – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166876/richmond-river-unreg-reg-alluvial-background.pdf.

46 DPIE (2020) *Draft Regional Water Strategy – Far North Coast Strategy October 2020,* p. 39. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0017/329012/draft-rws-fnc-strategy.pdf

- elevated temperatures – with average temperatures expected to rise across all seasons and maximum temperatures expected to increase by 0.4–1.0 degrees Celsius by 2030, and by 1.5–2.4 degrees Celsius by 2070, and minimum temperatures are expected to increase by 0.4–1.0 degrees Celsius by 2030
- increased evapotranspiration associated with rising temperatures
- extreme events with greater intensity, including more intense storm events.

Sea level anomalies have also been experienced in the region, most notably in August 2017 when the Bray Park Weir Pool experienced tidal incursion and saltwater contamination of the raw water supply. Overtopping of Bray Park Weir was caused by multiple factors, including low freshwater inflows, high tides and a sea level anomaly. Tweed Shire Council sought advice on the risk of overtopping of the weir with climate change and was advised that the occurrence of overtopping is forecast to increase with climate change.[47] Tidal incursion has occurred several times since the August 2017 event.

2.5 Aboriginal context

The Plan areas include parts of the Githabul Nation and are largely within the traditional lands of the Bundjalung (also spelt Bandjalang, Banjalang, Bunjulung, Bunjalung or Badjelang). The Bundjalung Nation has become a general term for the whole language area stretching from the far North East Coast of NSW and the Southern Eastern coast of Queensland. At the time of first European contact in the 1800s there were up to 20 dialects in the Nation.[48]

The land and water within these areas has always been significant for Aboriginal people for a range of cultural, spiritual, economic and practical reasons. Given the long period of Aboriginal connection to the area, there are many sites around the Richmond and Tweed catchments that are of ongoing Aboriginal significance (such as art sites, camp sites, middens, fishing and hunting areas, caves and rock shelters, burial sites, mythological sites and scarred trees).[49]

The LGAs within the Plan areas have significant Aboriginal and Torres Strait Islander populations. The highest is in Richmond Valley at 7.2 percent, Ballina (5 percent), and Kyogle and Tweed Shire (just over 4 percent) in 2016 (compared with 2.9 percent in NSW).[50]

There are eight LALCs in the Plan area; Muli Muli, Gugin Gudduba, Casino, Bogal, Ngulingah, Tweed Byron, Jali and Unincorporated LALC (see **Figure 4**).

There are several large native title determinations and claims across the Plan areas, which also include significant Indigenous Land Use Agreements (see **Figure 4**). Most of these areas fall within the Richmond catchment, with areas of native title along the western border of the Tweed catchment.

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47 Water Research Laboratory (2017) *Assessment of the risk of overtopping of Bray Park Weir and contamination of drinking water supply due to climate change*. Report to Tweed Shire Council. Available at: https://www.yoursaytweed.com.au/31175/widgets/181820/documents/66210.

48 Wafer, J. and Lissarrague, A. (2008) *A handbook of Aboriginal languages of New South Wales and the Australian Capital Territory*. Available at: https://pathfindersnsw.org.au/languages/bundjalung/.

49 Alluvium (2019) *Richmond River Governance and Funding Framework*. A report for DPIE and supporting local governments. Available at: https://richmondvalley.nsw.gov.au/wp-content/uploads/2020/02/Richmond-River-Governance-and-Funding-Framework-Final-Report.pdf.

50 .id Demographic Resources (2020) Community profiles for Kyogle Council, Richmond Valley Council, Lismore City Council, Ballina Shire Council, Byron Shire Council, Tweed Shire Council. Available at https://profile.id.com.au/.

The Bundjalung Native Title determinations cover both land and sea country and include some rights to water uses (see further discussion in **Section 8.1**). Although these native title processes took nearly two decades, it is significant in being only the third successful native title claim in NSW, the second time that native title sea rights have been recognised, and the first positive determination in a densely populated area of NSW. It also facilitated many proactive Indigenous Land Use Agreements throughout the determination process, including in national parks.

The native title determination is not only a symbolic achievement but has maintained, in practical terms, current land and water uses of Bundjalung peoples as Elder Yvonne Stewart explains: '*That recognition that we always knew that we had, it will give us the freedom to walk taller, it will give us freedom to continue to access and use our resources of country and look after our wellbeing*'.[51]

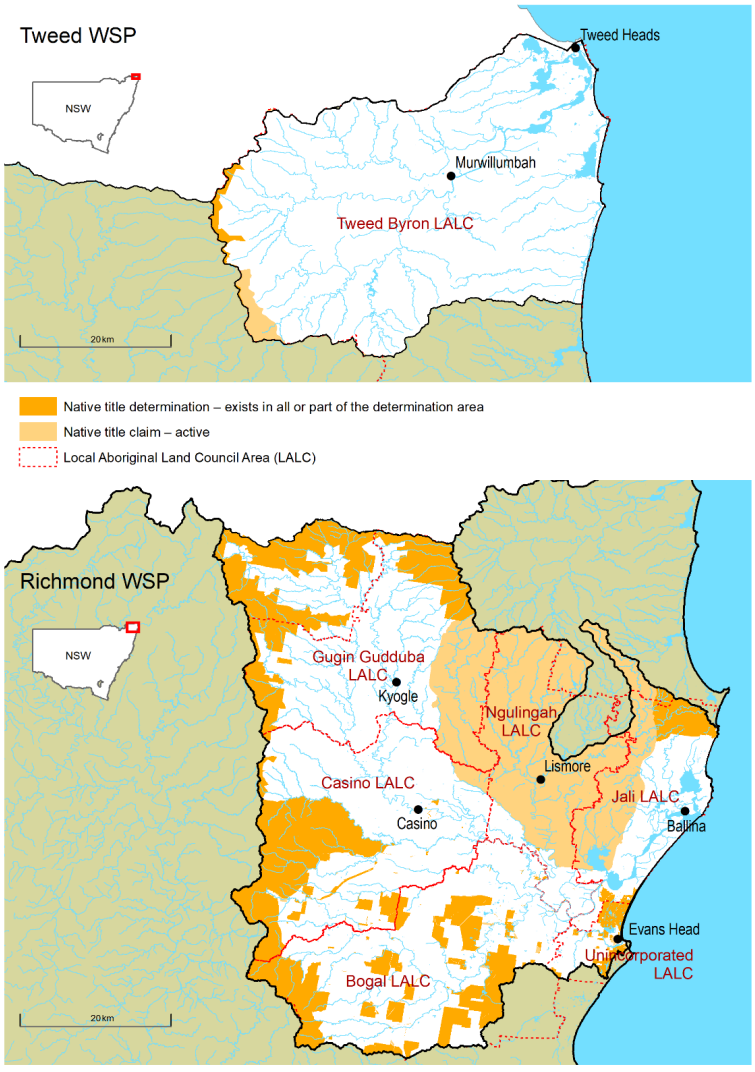

Figure 4: LALC and native title claim areas and determination areas for the Richmond and Tweed Plan areas[52]

51 Ross, H., Farrow-Smith, E. and Herbert, B. (2019) Byron Bay's Bundjalung people celebrate long-awaited land and sea native title determination. *ABC North Coast*, 30 April. Available at: https://www.abc.net.au/news/2019-04-30/byron-bay-native-title-land-rights/11057896#:~:text=%22Native%20title%20is%20a%20recognition,giving%20us%20the%20thumbs%20up.%22.

52 Map developed by the Commission using LALC data provided by DPI and native title areas from the National Native Title Tribunal website.

2.6 Socio-demographic context

There are six LGAs in the Plan areas, including Lismore, Ballina Shire, Byron Shire, Richmond Valley and Kyogle (in the Richmond Plan area) and Tweed Shire Council (in the Tweed Plan area).[53] The Tweed Plan aligns very closely with the Tweed Shire Council boundary but the Richmond Plan has large areas of Kyogle and Byron LGAs that sit outside of the Plan area (see **Figure 3**).

Table 3 provides a snapshot of the population in the region. Tweed Shire has the largest resident population, while Ballina Shire is the most densely populated. Most of the LGAs have higher densities than the regional NSW average, except for Kyogle.

The key areas of population growth over the last ten-year period have been Tweed, Byron and Ballina shires. Tweed Shire particularly is the largest and second fastest growing residential and rural-residential area in the region. Notably, it is adjacent to the highly developed Gold Coast region in Queensland. Rapid population growth has been occurring over the last ten years, aided by tourism and improved transport infrastructure, with high rates of growth forecast for the future. Population in the Tweed Shire is expected to grow by 36 percent between 2020 and 2041, well over the regional NSW estimated growth of 22 percent. Byron and Ballina shires are also steadily growing year on year and the region experiences significant fluxes in population as a major tourism destination.

Table 3: Population snapshot[54]

	Estimated Resident Population 2019 (no.)	Population density (persons per hectare)	Average annual population growth 2009-19 (%)	Forecast population change 2020-41 (%)
Tweed Shire	97,001	0.74	1.2	35.9
Lismore	43,692	0.34	-0.01	-1.7
Ballina Shire	44,628	0.92	1.0	15.4
Byron Shire	35,081	0.62	1.3	8.2
Richmond Valley	23,465	0.08	0.5	1.0
Kyogle	8,796	0.02	-0.7	11.3
Regional NSW	**2,777,654**	**0.04**	**0.82**	**22.3**

*Above Regional NSW average; **Below Regional NSW average; ***Negative growth

Table 4 shows that housing patterns remain largely dominated by low density, single dwelling houses, particularly in the more rural areas of Kyogle, Richmond Valley and Lismore. Medium to high density housing is high in the Tweed and Ballina Shires compared to Regional NSW and is growing significantly. Residential development is growing most rapidly in Tweed Shire with an average of 400 residential building approvals per year for the last ten-year period. Ballina and Byron shires have also demonstrated consistent growth in housing stock over this same period.

53 .id Demographic Resources (2020) Community profiles for Kyogle Council, Richmond Valley Council, Lismore City Council, Ballina Shire Council, Byron Shire Council, Tweed Shire Council. Available at: https://profile.id.com.au/.

54 *Ibid*.

Table 4: Housing snapshot[55]

	Low density single house dwellings (%) 2016	Medium-high density dwellings (%) 2016	Average annual residential building approvals (no.) 2009-19
Tweed Shire	61.7	30.2	400 (72% houses)
Lismore	81.5	15	140 (66% houses)
Ballina Shire	66.8	28.2	263 (73% houses)
Byron Shire	77.3	14.7	215 (75% houses)
Richmond Valley	80.6	14.2	53 (86% houses)*
Kyogle	94.1	2.5	29 (93% houses)*
Regional NSW	**80.2**	**17**	**-**

*Note: Richmond Valley and Kyogle data dates back to 2012 only i.e. average from 2012-19
Above Regional NSW average * Below Regional NSW average

Rapidly increasing population and tourism pressures are increasing the demand on town water supply (see detailed discussion in **Chapter 4**). Rous County Council reports that in 2024 water demand is predicted to match the reliable water supply of existing sources.[56] Beyond 2024, demand will exceed reliable supply and require new water sources combined with water conservation initiatives. In the Tweed Plan area, to meet demand pressures, Tweed Shire Council is investigating the option to raise Clarrie Hall Dam, which is expected to provide another 15 to 20 years of secure supply.[57]

2.7 Economic context

Table 5 lists the ten largest industries by value added[58] across all six LGAs in the Plan areas (out of 19 industry categories). Mining has been included as an addendum as it is a key water using industry.

55 *Ibid*.
56 Rous Water (2014) *Future Water Strategy, water security for our future*. Available at: https://rous.nsw.gov.au/page.asp?f=RES-LDO-72-56-37.
57 DPIE-Water (2020) *Draft Regional Water Strategy – Far North Coast: strategy*, p. 35. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0017/329012/draft-rws-fnc-strategy.pdf.
58 Value added by industry is an indicator of business productivity. It shows how productive each industry sector is at increasing the value of its inputs. It is a more refined measure of the productivity of an industry sector than output (total gross revenue), as some industries have high levels of output but require large amounts of input expenditure to achieve that (idProfile (2019) *Economic value – value added*. Available at: https://economy.id.com.au/value-add-by-industry).

Table 5: Top ten industries by value added across all six LGAs

Top ten industries	$ million	% of total	% change 2010/11 – 2018/19
Health Care and Social Assistance	1201.7	12.4	28.8
Construction	872.7	9.8	13.7
Retail Trade	751.4	7.7	16.3
Public Administration and Safety	652.7	7.6	-0.5
Accommodation and Food Services	577.5	8.5	11.6
Professional, Scientific and Technical Services	574.0	5.8	36.1
Agriculture, Forestry and Fishing	538.7	9.9	-4.5
Manufacturing	498.4	5.3	11.8
Education and Training	453.0	4.9	10.2
Rental, Hiring and Real Estate Services	416.8	4.3	1.6
Mining	*85.4*	*1.1*	*1.2*

Health care and social assistance and the construction industries are overall of highest value to the regional economy and have been growing over the last ten-year period. Retail and accommodation and food services are also significant and increasing contributors to the economy, associated with the high rates of tourism in parts of the region. Agriculture, forestry and fishing and manufacturing are key water using industries and of value to the economy in the region, although agriculture has decreased significantly in value add over the last ten-year period.

Overall, the most populated LGAs of Tweed, Ballina and Lismore contribute over three quarters of the total industry value to the regional economy. However, the economic patterns at a smaller geographical scale are more variable. Below are key economic data for each LGA, including overall Gross Regional Product (GRP)[59] and the most productive industry:

- **Tweed Shire:** estimated at **$3.75 billion** GRP – representing 0.6 percent of NSW's GSP. **Health Care and Social Assistance** is the sector with the most value added, generating just under $400 million in 2018/19.
- **Lismore City:** estimated at **$2.2 billion** GRP– representing 0.4 percent of NSW's GSP. **Health care and social assistance** is the sector with the most value added, generating just over $380 million in 2018/19.
- **Ballina:** estimated at **$2 billion** GRP, – representing 0.35 percent of NSW's GSP. **Health care and social assistance** is the sector with the most value added, generating just over $200 million in 2018/19.
- **Byron Shire:** estimated at **$1.8 billion** GRP– representing 0.3 percent of NSW's GSP. **Construction** is the sector with the most value added, generating $149 million in 2018/19.

[59] The GRP of an area is the equivalent of Gross Domestic Product, but for a smaller area. It is the amount of the nation's wealth which is generated by businesses, organisations and individuals working in the area. This dataset is derived from the National Economics microsimulation model and is a broad indicator of the growth or decline of the local economy over time. See: https://economy.id.com.au/rda-sydney/gross-product.

- **Richmond Valley:** estimated at just under **$0.9 billion** GRP– representing 0.1 percent of NSW's GSP. **Manufacturing** is the sector with the most value added, generating $167 million in 2018/19.
- **Kyogle:** estimated at just over **$0.3 billion** GRP– representing 0.05 percent of NSW's GSP. **Agriculture, forestry and fishing** is the sector with the most value added, generating just under $70 million in 2018/19.

2.7.1 Industries dependent on water extraction

In the Richmond Plan, there are ten unregulated water sources that have high economic significance due to the value of the commercial extraction to local communities to support irrigation, typically for nurseries, orchards, pasture (for dairy production and to a lesser extent beef production) and vegetables (see **Appendix B**). The well-drained soils on the Alstonville Plateau support a diverse range of horticultural industries. When the Richmond Plan commenced, sugar cane was the dominant crop on the estuarine flats of the floodplain between Ballina and Coraki.[60]

In the Tweed Plan, 14 water sources are classified as having high economic significance, mostly due to the value of production from irrigation but also including reference to tourism and recreation values.[61] Irrigated agriculture has grown as agricultural industries have become more diversified in the region.[62]

Kyogle, Richmond and Lismore had the highest total value in agricultural production in the region in 2015/16:

- The total value of agricultural production in Kyogle LGA was $86 million, with the highest agricultural production value from livestock slaughterings (67 percent) followed by milk (20 percent) and other industries including dairy and beef farming and timber production, with some vegetable and grain growing.[63]
- In Richmond Valley LGA, the total value of agricultural production was $81 million, with the highest agricultural production value from livestock slaughterings (70 percent) followed by other broadacre crops (15 percent), cattle grazing, sugar cane and wheat growing.[64]
- In Lismore LGA, the total value of agricultural production was $92 million, with the highest agricultural production value from nuts (37 percent) followed by livestock

60 DPI-Water (2016) *Water Sharing Plan for the Richmond River Unregulated, Regulated and Alluvial Water Sources – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166876/richmond-river-unreg-reg-alluvial-background.pdf.

61 NSW Office of Water (2010) *Water Sharing Plan, Tweed River Area Unregulated and Alluvial Water Sources Background document*. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0004/549418/wsp_tweed_river_background.pdf

62 DPI-Water (2016) *Water Sharing Plan for the Richmond River Unregulated, Regulated and Alluvial Water Sources – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166876/richmond-river-unreg-reg-alluvial-background.pdf.

63 id Demographic Resources (2020) *Kyogle Council Area – Agriculture*. Available at: https://economy.id.com.au/kyogle/value-of-agriculture.

64 id Demographic Resources (2020) *Richmond Valley Council Area – Agriculture.* Available at: http://economy.id.com.au/richmond-valley/value-of-agriculture.

slaughterings (29 percent).[65] The area is also characterised by dairy farming, macadamia nut, coffee, tea tree, tropical fruit and sugar growing, and pig farming.[66]

Other key industries such as construction and manufacturing are also key water using industries. There are seven bottled water operators in the Northern Rivers region with combined allocations of 270 ML per year.[67]

2.7.2 Industries dependent on water access

Water in the region is also highly valued for its non-extractive uses such as fishing, tourism and recreation. Byron and Tweed Shire particularly have high value tourism industries characterised by large numbers of visitors, spend and related employment:

- In 2018/19, the total tourism and hospitality sales in Byron Shire was just under $580 million (a total value added of $340 million). Direct full-time employment in tourism activities represents 14 percent of the total tourism industry in Australia and 12 percent of its value add.
- In 2018/19, the total tourism and hospitality sales in Tweed Shire was just over $575 million (a total value added of just over $290 million). Direct full-time employment in tourism activities represents 6 percent of the total tourism industry in Australia and 6 percent of its value add.

Access to high quality coastal and other waterways is critical to supporting the tourism and recreation activities on which the industry relies. For example, in the Tweed River estuary alone fishing is the most popular water-based activity on the Tweed River Estuary (71 percent), followed by motorised boating (30 percent), swimming (26 percent) and canoeing/kayaking (21 percent).[68] In 2018-19, the North Coast received 42 percent of international visitors, 23 percent of domestic overnight visitors and 17 percent of domestic daytrip visits to regional NSW. This equated to 13.7 million visitors spending $4.7 billion.[69] Proximity to the Gold Coast Airport and Brisbane contribute to Tweed Shire's strong tourism and retirement industries.[70]

65 id Demographic Resources (2020) *Lismore City Council Area – Agriculture.* Available at: http://economy.id.com.au/lismore/value-of-agriculture.

66 *Ibid*.

67 NSW Chief Scientist & Engineer (2019) *Independent review of the impacts of the bottled water industry on groundwater resources in the Northern Rivers region of NSW - Final Report*. Available at: https://www.chiefscientist.nsw.gov.au/__data/assets/pdf_file/0019/285040/Final-Report_Northern-Rivers-Bottled-Water-Review.pdf.

68 Hydrosphere Consulting (2017) *Coastal Management Program for the Tweed River Estuary: Recreational Use Study.* Available at: https://www.yoursaytweed.com.au/tweed-river-estuary.

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

70 NSW Office of Water (2010) *Water Sharing Plan, Tweed River Area Unregulated and Alluvial Water Sources Background document*. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0004/549418/wsp_tweed_river_background.pdf

3 Overall advice on extension and replacement

3.1 The Plans should be extended and replaced to address key risks

The Commission's review has identified a range of issues that justify replacing the Plans. These are outlined in the following chapters:

- While town water supply needs have largely been met under the current Plans, projected population growth and climate change will place pressure on the region's water resources and their many different uses and values, including town water supply (**Chapter 4**).
- The Plans do not set clear, sustainable numeric LTAAELs. LTAAELs also do not consider risks from growing basic landholder rights extraction. AWDs have not been used to ensure compliance with LTAAELs and could be used to better manage extraction during drought (**Chapter 5**).
- Provisions to support environmental outcomes can be strengthened. Few environmental releases have been made under the Richmond Plan, while releases under the Tweed Plan can be optimised. There is limited evidence that provisions protecting the Richmond tidal pool, low flows and threatened native fish are effective. Some rules are impractical to follow and do not reflect best available information. The Plans also lack rules to mitigate the risk of disturbing acid sulfate soils, which can create water quality issues (**Chapter** Error! Reference source not found.).
- The Plans do not appear to adequately manage connected water sources or groundwater dependent ecosystems, creating risks to environmental and economic outcomes, as well as potential inequities. The Plans do not reflect industry changes and trade rules are restrictive and difficult to understand and implement (**Chapter** Error! Reference source not found.).
- Aboriginal values are not adequately considered, and Aboriginal licence categories inhibit any meaningful water use (**Chapter 8**).
- As with other water sharing plans, the Plans have limited MER, making it difficult to measure outcomes and to effectively review them (**Chapter 9**). There are also several issues relating to the development and implementation of the Plans (**Chapter 10**).

Given these issues, the Plans do not adequately manage a range of risks to environmental, social and economic outcomes. The Commission recommends replacing the Plans 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 Plans 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 Regional planning activities should inform the revised Plans

In response to identified risks to water resources in the Far North Coast, the NSW Government and local councils in the region are completing several strategies that will have implications for the way water is managed under the Plans. The replacement Plans should align with these initiatives. Key strategies include:

- ***Far North Coast Regional Water Strategy*** – Regional water strategies are being developed as part of the NSW Government's commitments in response to the *NSW State Infrastructure Strategy 2018*, including the Far North Coast as one of six priority areas. A draft strategy was on public exhibition until December 2020 and the final report is due in

2021. The draft strategy includes a long list of options for improving water security and reliability, protecting, and enhancing natural systems and community preparedness for climate extremes. Initiatives under the strategy, as well as studies underpinning these (including climate modelling), will likely have implications for many provisions in the Plans, including but not limited to LTAAELs, environmental releases and high flow conversions. This is likely to drive state level funding for any infrastructure projects going forward.

- **Rous County Council's *Future Water Project 2060* –** This sets out a plan to meet short to medium term and long-term demand needs based on investigations undertaken by Rous County Council. It was released for community consultation in September 2020. However, in December 2020, Councillors resolved not to pursue the proposed option of the Dunoon Dam for long term supply and instead focus on pursuing groundwater for short-medium term security and recycled water for long-term security.[71] Further investigations are underway by Rous County Council, which may have implications for the revised Richmond Plan.
- **Tweed Shire Council's environmental impact statement for the raising of Clarrie Hall Dam –** In December 2015, Tweed Shire Council adopted the preferred option to raise Clarrie Hall Dam to address security of town water supply concerns. An environmental impact statement for Clarrie Hall Dam, which will include consideration of cultural heritage sites is due for completion in February 2021 and will be on public exhibition in March 2021.

3.3 Overall recommendation

R 1

The Plans should be:

a) extended for a further two years until 30 June 2023, with priority actions progressed in the interim, to allow time to complete data collection, analysis and modelling and to consider regional water planning processes currently underway.

b) replaced by 1 July 2023, supported by the completion of the recommendations of this review.

[71] Rous County Council (2020) *Dunoon Dam shelved as Rous County Councillors endorse groundwater for short-to-medium term water security and recycled water for long-term* [press release], 21 December. Available at: https://rous.nsw.gov.au/page.asp?f=RES-IGX-11-85-67.

4 Population growth and climate change risk town water supply

This chapter focuses on issues relating to town water supply, which was identified as a critical issue for both Plans.

Town water supply needs were largely met under the current Plans, although drought impacted water availability, particularly in 2019 and early 2020. Climate change and projected population growth are expected to place pressure on town water supply in both Plan areas. For example, there is a significant risk that future needs will not be met within the term of a replacement Tweed Plan, particularly for the villages of Uki and Tyalgum. There may be a need to increase entitlements for local water utilities in the replacement Tweed Plan for these villages, but this requires more rigorous assessment by DPIE-Water. Regional planning processes are underway in both Plan areas to manage risks to town water supply that should be considered in developing replacement plans (**Sections 4.1** and **4.2**).

Any action to increase utility supply to meet future needs should only be considered as part of a wider integrated approach to water security and sustainability. To complement water sharing plans, water management improvement practices such as reuse, efficiency measures and behaviour change initiatives are critical, as is a clear identification and provision for environmental needs.

4.1 There are risks to town water supply in Richmond

Town water supply accounts for around 21 percent of water entitlement in the Richmond Plan area.[72] However, it is not known what percentage of actual usage it accounts for as most extraction in the system is not metered. Rous County Council is the regional water supply authority responsible for bulk water supply across the council areas in the Richmond Plan area. It is largely reliant on surface water and owns and operates two of the dams in the Plan area (Rocky Creek and Emigrant Creek dams), but also sources water from borefields when conditions are dry.

Rous County Council provides bulk water to direct retail customers and four local water utilities, including:

- Ballina Shire Council (excluding Wardell and surrounds)
- Byron Shire Council (excluding Mullumbimby)
- Lismore City Council (excluding Nimbin)
- Richmond Valley Council (excluding Casino and land west of Coraki).[73]

72 Based on data from WaterNSW from itsWater Licensing System, accessed 3 December 2020.

73 Wardell is supplied from Marom Creek, Mullumbimby from the Wilsons River via Lavertys Gap Weir, Nimbin is supplied from Mulgum Creek and the townships of Casino and Kyogle extract their water directly from the Richmond River. Groundwater at Alstonville and Woodburn is also used during dry periods, but these sources are subject to the provisions of the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* (Alstonville) and the *Water Sharing Plan for the North Coast Coastal Sands Groundwater Sources 2016* (Woodburn).

Town water supply needs have largely been met over the life of the Richmond Plan, although water restrictions were put in place for some communities to reduce pressure on declining resources in 2019 and early 2020, when the region was in drought.

Long-term water demand in the Richmond Plan area is forecast to increase. Climate change and projected population growth are expected to place pressure on the region's water supply, with demand expected to exceed reliable supply:[74]

- **Climate variability and climate change** – Studies indicate climate change will mean less reliable rainfall and warmer conditions for the Richmond area. The region's water security – the certainty that water needs can be met by a reliable supply without undue water restrictions – is expected to decline. Water balance modelling indicates that, within the term of a replacement Richmond Plan, secure yield with climate change will reduce from 13,350 ML per year in 2020 to 11,775 ML per year in 2030 (an 11.8 percent reduction) and continue to fall beyond 2030.[75]
- **Population growth** – as part of its *Future Water Project 2060*, Rous County Council has forecast water supply demand. Within the term of the next water sharing plan forecast demand is expected to increase from 12,247 ML in 2020 (47,962 bulk water connections) to 13,595 ML in 2030 (55,839 bulk water connections).[76] While the projected 2030 demand falls within the current entitlement, it appears that it will exceed reliable supply by 1,820 ML by 2030, with the deficit to continue to grow beyond 2030. There are also likely to be increases in basic landholder rights with subdivisions (see **Section 5.2**), placing further strain on the water sources.

  In addition to being important for residents, town water supply is critical for supporting many businesses, particularly in the tourism sector. The Far North Coast, including Byron Bay, has experienced a steady increase in tourism over the past ten years. Growth in tourism visitation to Byron Bay has outpaced NSW overall, with total visitation between 2014 and 2018 estimated to have grown by 49 percent, compared to 11 percent for NSW.[77] At the end of 2019, there were 2.41 million visitors to Byron Bay, up 9 percent year-on-year, with total nights stayed up 18.9 percent and a total estimated gross expenditure of $883 million.[78]

Where there are changes in population, the Act allows the Minister to vary the share component of local water utility access licences at five-year intervals.[79] It is not clear if the Act allows or intends for the Minister to simultaneously increase the LTAAEL to match the new entitlement. However, because the definition of LTAAEL in the Richmond Plan includes the sum of share components for special use licences (which includes local utilities), the LTAAEL would automatically increase if the Minister increased local utility entitlement under the current provisions. The LTAAEL could be otherwise maintained by proportionate reductions for other

74 The Commission recognises that there are a range of sources for understanding climate variability and climate change available. Rous County Council's data are presented here to provide an understanding of its preferred proposal. The stochastic modelling in the regional water strategy may provide additional insights and should be considered in developing the replacement Richmond Plan.

75 Hydrosphere Consulting (2020) *Rous County Council Future Water Strategy: Coarse Screening Assessment of Options – Final Report*. Available at: https://rous.nsw.gov.au/page.asp?f=RES-XXH-37-21-03.

76 Rous County Council (2020) *Future Water Project 2060,* p. 5. Available at: https://rous.nsw.gov.au/cp_themes/default/page.asp?p=DOC-KZG-22-16-87.

77 .id Consulting (2018) *Byron Bay Shire Council tourism and impact analysis*, p. 6. Available at: https://www.byron.nsw.gov.au/Business/Business-in-Byron/Tourism/Research-and-Reports.

78 Destination Byron (2020) *Snapshot Byron Bay visitor economy – key results for year-end December 2019*. Available at: https://www.destinationbyron.com.au/wp-content/uploads/2020/07/Infographic-Byron-Shire-Tourism-Monitor-Dec-2019.pdf.

79 See Clause 66(3) of the Act.

licence categories or entitlements can be purchased from the market (where trade rules allow – see **Section 5.1**). However, the Commission understands that overall water availability and capacity particularly in times of low flows – not the share component – is the main issue in the Richmond Plan area, at least for the term of the next water sharing plan.

Significant resourcing has gone into strategic planning and investigation of options to improve the security of town water supply on the Far North Coast. DPIE-Water's *Far North Coast Regional Water Strategy* aims to help address future water resource challenges and deliver an integrated, cost-effective package of measures to meet community needs and protect the environment.

Rous County Council has also examined a range of options over the past decade for securing town water supply and conducted its own studies to provide for increased demand amid a changing climate:

- In 2014, Rous County Council released the *Future Water Strategy,* which canvassed a range of options and actions around water efficiency, groundwater augmentation and water reuse. More detailed investigations followed to determine the viability of options and the extent they would support or supplement existing resources.
- In 2020, Rous County Council released the *Future Water Project 2060,* which draws on the outcomes of investigations conducted since 2014 and prior to the *Future Water Strategy* to set out a plan to meet short to medium term demand needs.

Rous County Council considers the findings of past investigations are still valid. However, it is beyond the scope of the Commission's review to do detailed analysis of these options.

Rous County Council identified the proposed Dunoon Dam as the lowest cost scenario for providing the necessary water security to 2060 and beyond.[80] However, following community consultation on the *Future Water Project 2060*, Councillors resolved not to pursue the dam and instead focus on groundwater (short to medium term) and recycled water (long term), as well as demand management as the preferred options.[81]

Further, the Richmond Plan would not have allowed for the Dunoon Dam without an exemption as it would be located on Rocky Creek (downstream of the existing Rocky Creek Dam) – a third order or higher stream in the Terania Creek Water Source. Clause 65(1)(h) of the current Richmond Plan prohibits in-river dams on third order or higher streams for specific water sources with high ecological values, including the Terania Creek Water Source, in line with the Act.

Terania Creek Water Source is protected by this clause due to its high in-stream values, including 16 threatened species, high diversity and significant area of national park.[82] Recently updated HEVAE mapping indicates that it would currently be classified as having very high ecological value. As such, it is appropriate that dams remain prohibited on this water source.

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80 Rous County Council (2020) *Future Water Project 2060,* p. 9. Available at: https://rous.nsw.gov.au/cp_themes/default/page.asp?p=DOC-KZG-22-16-87.

81 Rous County Council (2020) Media releases. Monday, 21 December 2020. Available at: https://rous.nsw.gov.au/page.asp?f=RES-IGX-11-85-67.

82 DPI-Water (2016) *Water Sharing Plan for the Richmond River Unregulated, Regulated and Alluvial Water Sources – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166876/richmond-river-unreg-reg-alluvial-background.pdf.

To protect the Richmond Plan's environmental objectives, consideration of options must define the environmental water requirements to ensure the minimum requirements for the future sustainability of the river ecosystem are met, taking into consideration future climate change and population growth.

4.2 Town water supply needs in the Tweed are met but future needs are at risk

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.[83] The Plan recognises this by providing a full share of water for annual town water supplies, apart from in exceptional drought conditions.

The local water utility share component in the Tweed Plan is 27,613 ML per year (representing 79 percent of total water entitlement, see **Table 2**).[84] Town water supply can be accessed from the Mid Tweed River Water Source (27,567 ML per year, including 67 ML per year for Uki) and 46 ML per year from the Upper Oxley River Water Source, which provides raw water to Tyalgum.[85]

Tweed Shire Council owns and operates two structures in the Tweed catchment; Clarrie Hall Dam (15,000 ML) which is situated on Doon Doon Creek and Bray Park Weir (520 ML) on the Tweed River. The Tweed Plan includes operational rules for both structures, which require daily environmental flow releases based on flows at a flow reference point.[86] Extraction occurs from Bray Park Weir Pool, primarily for town water supply (Tweed District Town Water Supply) but also domestic and stock purposes and irrigation. The weir pool is supplied by the Tweed and Oxley rivers. Bulk water releases are made from Clarrie Hall Dam to top up the weir pool during drought. Between 2008 and 2019, bulk water releases occurred 2 percent of the time.[87] Tweed Shire Council advised that, for the 2020 calendar year to October, bulk water releases occurred 7 percent of the time.

4.2.1 Town water supply is at risk from saltwater contamination

Bray Park Weir, located on the Tweed River about five kilometres upstream of Murwillumbah, forms an artificial upstream tidal limit in the Tweed River.[88] In recent years, the weir pool has experienced saltwater incursion and subsequent contamination of raw water. A major overtopping event occurred in August 2017, which impacted the Tweed town water supply system. Based on data provided by Tweed Shire Council, the weir has overtopped 33 times

83 Section 58(1) of the Act 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*'.

84 See Clause 24 of the Tweed Plan.

85 See Clause 24 of the Tweed Plan.

86 See Clause 29 of the Tweed Plan.

87 Eco Logical Australia (2019) *Environmental flow assessment raising Clarrie Hall Dam.* Available at: https://www.yoursaytweed.com.au/31175/widgets/181820/documents/121796.

88 NSW Office of Water (2010) *Water Sharing Plan, Tweed River Area Unregulated and Alluvial Water Sources Background document*. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0004/549418/wsp_tweed_river_background.pdf.

since this event, with protection deployed on 29 of these occasions.[89] Overtopping of Bray Park Weir was attributed to several factors including low freshwater inflows, high tides and a sea level anomaly – events that are largely beyond the control of the Tweed Plan.

Tweed Shire Council received advice that the occurrence of overtopping of the weir is forecast to increase with climate change.[90] The frequency of low flows insufficient to hold back salt water from the estuary is also expected to increase.

In response to the ongoing risk of overtopping, Tweed Shire Council established the Bray Park Weir Tidal Protection Project and a project reference group to advise on possible solutions. The Project Reference Group presented its preferred options to Council in April 2020.[91] Tweed Shire Council also commissioned advice from consultants to better understand the causal factors and suitable mitigation measures. In June 2020, the Council resolved to progress with a hinged barrier across Bray Park Weir to address the risk of tidal inundation. More detailed investigations and a concept design for this preferred option is underway. This will also require consideration of fish passage and environmental flow rules for Bray Park Weir as set out in Clause 29 of the Tweed Plan.

Temporary measures are currently used to manage saltwater contamination until a permanent solution is in place. Saltwater ingress into the weir pool is being managed through the installation of temporary barriers that also render the fishway at the weir as ineffective when the barriers are in place by blocking the fish ladder. While these temporary barriers are important to protect raw water in the weir pool from saltwater contamination, they also result in the weir operating inconsistently with rules in the Tweed Plan. Specifically this is inconsistent with Clause 29 of the Tweed Plan, which requires environmental flows to pass the weir on a daily basis.

The impact on native fish should be addressed as a priority by expediting a permanent solution that supports more effective fish passage and improves outcomes for native fish. Provisions under the *Fisheries Management Act 1994* will be triggered and will require a new fishway to improve fish passage.

Releases from Clarrie Hall Dam and curtailing water access during periods of low flow could mitigate tidal ingress into the weir pool via freshwater inflows. Such requirements could be built into a replacement Tweed Plan. However, should the Tweed Shire Council implement a hinged barrier across the weir[92] and a new fishway design, this should address the saltwater contamination concerns. If the barriers are installed changes to the Plan are not likely to be necessary.

It would be beneficial for Tweed Shire Council to have a notification process for any future events of saltwater contamination (despite infrastructure upgrades) so that other users that draw on the tidal pool are aware and can manage the impacts. Tweed Shire Council already monitors for sea level anomalies and has alarms on its water filtration plant that are trigged by elevated salinity readings.

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89 Based on ingress data from Tweed Shire Council for period to 19 August 2020.

90 Water Research Laboratory (2017) *Assessment of the risk of overtopping of Bray Park Weir and contamination of drinking water supply due to climate change*. Available at: https://www.yoursaytweed.com.au/31175/widgets/181820/documents/66210.

91 Project Reference Group (2020) *Bray Park Weir Tidal Protection Project – Project Reference Group report to Tweed Shire Council*. Available at: https://www.yoursaytweed.com.au/31175/widgets/181820/documents/166388.

92 Tweed Shire Council (2020) *Council votes for hinged barrier across weir pool* [press release]. 19 June. Available at: https://www.tweed.nsw.gov.au/MediaReleases/2823.

4.2.2 Current water supply needs have been met, but future needs are at risk

Town water supply needs have largely been met over the life of the Tweed Plan, with adequate entitlements for local water utilities. In some years, water usage at the small villages of Uki and Tyalgum was close to the entitlement limit.

Drought conditions in 2019 and early 2020 placed pressure on water availability, during which water was carted into Tyalgum village.[93] Business owners and residents of Tyalgum village were placed on Level 2 water restrictions for around three months to curtail water use until adequate rain fell. In addition, customers of the Tweed District Water Supply also went on Level 2 water restrictions from December 2019 to February 2020 as the water level in Clarrie Hall Dam fell.

There is a significant risk that future needs will not be met within the term of a replacement Tweed Plan, particularly for the villages of Uki and Tyalgum. Tweed Shire Council advised that it is unlikely the latest demand forecast for dry years at Tyalgum and Uki will be met under current share components as set out in Clause 24 of the Plan. Information provided by Tweed Shire Council indicates that dry year demand at Tyalgum is forecast to rise to 47.3 ML by 2035.[94] Further, the dry weather demand for Uki is forecast to reach 75 ML by 2035, versus the 67 ML share component in the Tweed Plan. In some cases, actual demand may exceed forecast dry year demand. On this basis, Tweed Shire Council is seeking increases to its local water utility share components, with revised shares of 60 ML per year and 100 ML per year respectively for Tyalgum (Upper Oxley River Water Source) and Uki (Mid Tweed River Water Source).

As with the Richmond Plan, the Tweed Plan LTAAEL is defined to include the share component for local utilities. Therefore, increasing entitlement for town water supply would automatically increase the LTAAEL under current provisions. However, the LTAAEL should be based on an ecologically sustainable extraction limit. Any change to the LTAAEL should be considered in the context of environmental impacts and whether carryover is appropriate. A rigorous assessment of the proposed additional entitlement will need to be undertaken by DPIE-Water. See **Section 5.1** for further discussion regarding LTAAEL recommendations.

4.2.3 Securing town water supply for the future

In submissions and interviews, securing future town water supply was raised as a significant concern for stakeholders in the Tweed Plan area. The Tweed region has experienced significant population growth over the past 10 years and the population of the LGA is predicted to increase by around 36 percent from 2020 to 2041.[95] This will place significant pressure on town water supply given increased demand amid a changing climate.

Tweed Shire Council has implemented a range of demand management initiatives to reduce pressure on town water supply, but these alone are not considered adequate to meet the needs of a growing population and climate change. Tweed Shire Council has been investigating town water supply augmentation options for several years, including[96]:

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93 Tweed Shire Council (2019) *Council carting water into Tyalgum* [press release], 19 November. Available at: https://www.tweed.nsw.gov.au/MediaReleases/2660.

94 Hydrosphere (2020) *Tweed District, Uki and Tyalgum water supplies*: *Demand forecasts*. Available at: https://www.yoursaytweed.com.au/31175/widgets/181820/documents/106520.

95 .id Demographic Resources (2020) *Tweed Shire Council population forecast*. Available at: https://forecast.id.com.au/tweed.

96 Water and Wastewater (2015) *Water supply augmentation – selection of preferred option*. Available at: https://www.tweed.nsw.gov.au/Augmentation.

- raising Clarrie Hall Dam
- building Byrrill Creek Dam (different variations) – currently prohibited
- linking to South-East Queensland Water
- linking to Gold Coast City Council.

In December 2015, Tweed Shire Council adopted the preferred option to raise Clarrie Hall Dam, which is expected to provide another 15 to 20 years of secure supply.[97] An environmental impact statement for Clarrie Hall Dam is due in February 2021 and will be on public exhibition in March 2021. Raising the dam will have implications for environmental flows downstream and system operational rules as set out in Clause 29 of the Tweed Plan. **Section 6.1.2** discusses current rules and opportunities to improve environmental outcomes downstream of Clarrie Hall Dam. It is beyond the scope of the Commission's review to do detailed analysis of the proposed raising of Clarrie Hall Dam. It is anticipated that this option will be considered in more detail in the *Far North Coast Regional Water Strategy.*

There are potential changes in upstream hydrology associated with the proposed raising of Clarrie Hall Dam, combined with installation of a hinged barrier across Bray Park weir as discussed in **Section 4.2.1**, including implications for hydrology and connectivity with the estuary. The existing impacts of these structures on water quality[98] and fish passage, and potential impacts from proposed infrastructure augmentation require consideration. Environmental flow rules in the Tweed Plan should be reviewed and amended as necessary to mitigate potential adverse impacts on the Tweed estuary, particularly the upper estuary.

Clause 48(1) of the Tweed Plan prohibits in-river dams on third order or higher streams in Byrrill Creek Water Source and other high-value water sources in the Tweed Plan area.[99] In addition, Tweed Shire Council placed a moratorium on any dam proposal for Byrrill Creek for a period of 20 years, effective from 15 May 2012. Submissions expressed overwhelming support for retaining this plan provision and upholding Tweed Shire Council's moratorium.

While the option to build a dam on Byrrill Creek would provide an additional 36 gigalitres of storage, it was ruled out due to concerns that this proposal would impact the high instream values associated with Byrrill Creek. It would also inundate areas of high conservation value and impact sites of cultural significance.

Clause 48(1) of the Tweed Plan should be retained to prohibit in-river dams on third order or higher streams with high instream values. The list of water sources included under this provision should also be updated based on the latest HEVAE mapping, which seems to indicate that additional water sources have been classified as 'high' or 'very high'. Key fish habitat mapping should also be considered in revising listed water sources covered by this plan provision.

DPIE-Water should ensure the replacement Tweed Plan aligns with the outcomes of investigations and modelling undertaken as part of the development of the *Far North Coast Regional Water Strategy* as well as the environmental impact statement underway for the

97 DPIE-Water (2020) *Draft Regional Water Strategy – Far North Coast*, p. 35. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0017/329012/draft-rws-fnc-strategy.pdf.
98 Hydrosphere (2017) *Coastal Management Program for the Tweed River Estuary: water quality assessment*. Report prepared for Tweed Shire Council.
99 Clause 42(2) of the Tweed Plan.

proposed raising of Clarrie Hall Dam. DPIE-water should include identified risks to town water as part of the MER requirements of the Plan.

4.3 Recommendations

R 2 – Richmond Plan	By 1 July 2023, to ensure town water supply risks are managed while improving environmental outcomes in the Richmond Plan area, DPIE-Water should: a) maintain the prohibition on in-stream dams on third order and greater streams consistent with the Act and the latest HEVAE mapping of instream values and take into consideration key fish habitat mapping b) consider the outcomes of investigations undertaken as part of the *Far North Coast Regional Water Strategy* and *Rous Future Water Project 2060* in drafting Plan provisions. *See also* ***Recommendation 6*** *regarding environmental outcomes.*
R 3 – Tweed Plan	By 1 July 2023, to ensure town water supply risks are managed while maintaining environmental outcomes in the Tweed Plan, DPIE-Water should: a) consider the outcomes of investigations undertaken as part of the Bray Park Weir Tidal Inundation Project (including fishway design) and Clarrie Hall Dam augmentation environmental impact statement b) review demand forecast and other studies from Tweed Shire Council to determine if the share component of the local water utility access licences requires an increase to meet the forecast demand for Tyalgum and Uki, or whether this could be met through other measures c) retain provisions that support the prohibition of in-stream dams on third order and greater streams (including in the Byrrill Creek Water Source) and ensure these provisions reflect the latest HEVAE mapping and key fish habitat mapping.

5 Extraction is not effectively managed

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 licensed users and under basic rights. To do this, the Plans establish extraction limits (LTAAELs). LTAAELs are established for extraction management units that cover a geographic area sometimes consisting of multiple water sources. There are three extraction management units in each of the Richmond and Tweed Plans (outlined in **Sections 2.1** and **2.2**).

Setting appropriate extraction limits is critical; a limit which is too high will reduce the amount of water remaining for the environment and downstream water users, while a limit which is too low reduces economic and social opportunities.

Similarly, the regular assessment of compliance with the LTAAEL and response to any exceedance (non-compliance) is an important part of protecting the environment, basic rights and the distribution of water shares as intended by the Act and the Plans. The Commission notes that according to the Section 44 implementation audits recently completed, the required annual assessment of compliance did not occur between 2011 and 2019.[100, 101] This was true even for the Richmond Regulated River Extraction Management Unit where water users are metered (**Section 5.1**).

There are several issues related to extraction limits under the Plans:

- The Plans do not set clear, fixed numeric LTAAELs based on sustainable limits. This includes the Richmond Regulated Water Source, which is unusual for a regulated water source where there typically is a volumetric extraction limit. (**Section 5.1**).
- LTAAELs do not consider the potential for increased basic landholder rights extraction, which is a significant risk in the region (**Section 5.2**).
- AWDs, which determine how much water each licence holder can extract over a stated timeframe (usually annually), have not been adequately applied to ensure compliance with LTAAELs. Subject to investigation, the use of AWD could be expanded to better manage extraction from the Richmond tidal pool and alluvial aquifers during drought (**Section 5.3**).

5.1 Plans lack sustainable, fixed numeric LTAAELs

The Plans establish LTAAELs for each extraction management unit. These limits are not specified numerically in the Plans, but are described as components that comprise the LTAAELs (i.e. the sum of share components of all access licences, plus annual domestic and stock rights requirements and native title rights, plus any additional local water utility access licence share component). This is consistent with the policy position at the time of Plan development:

100 Alluvium and Vista Advisory (2019) *Audit of the Water Sharing Plan for the Richmond River Area Unregulated, Regulated and Alluvial Water Sources.* Report prepared by Alluvium Consulting Australia and Vista Advisory for DPIE. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0008/289502/Richmond-River-Area-Unregulated,-Regulated-and-Alluvial-Water-Sources-2010.pdf.

101 Alluvium and Vista Advisory (2019) *Audit of the Water Sharing Plan for the Tweed River Area Unregulated, Regulated and Alluvial Water Sources.* Report prepared by Alluvium Consulting Australia and Vista Advisory for DPIE. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0011/289505/Tweed-River-Area-Unregulated-and-Alluvial-Water-Sources-2010.pdf.

> '*In coastal EMUs, the LTAAEL will equal the sum of all existing unregulated entitlements; located within the surface waters and the groundwaters of the highly connected (upriver) alluvial aquifers, plus an allowance for an increase in entitlement, if conversion from low flow extraction to high flow extraction is applicable or from new entitlements*'.[102]

It would be more transparent and efficient for compliance purposes if the Plans included tables with fixed volumetric LTAAELs. Establishing fixed, numeric LTAAELs that are assessed regularly is also important to:

- ensure environmental needs are protected and not compromised by extraction for other purposes
- 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
- 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.

Section 44 implementation audits of the Plans found that a lack of metering meant the volume of extraction in the unregulated and alluvial water sources had not been determined.[103] While other means are available to estimate water use such as electricity consumption and log books, they are resource intensive and unlikely to be as accurate as metered take.[104]

Audits also found there is no procedure for logbooks to monitor usage and whether usage is in account limits.[105] Despite metering of regulated river water users, compliance with the LTAAEL for the Richmond Regulated River Extraction Management Unit does not appear to have been assessed.

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102 NSW Office of Water (2011) *Macro water sharing plans – the approach for unregulated rivers: A report to assist community consultation*, pg. 15. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0008/548153/macro_unreg_manual_web.pdf.

103 Alluvium and Vista Advisory (2019) *Audit of the Water Sharing Plan for the Richmond River Area Unregulated, Regulated and Alluvial Water Sources.* Report prepared by Alluvium Consulting Australia and Vista Advisory for DPIE. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0008/289502/Richmond-River-Area-Unregulated,-Regulated-and-Alluvial-Water-Sources-2010.pdf; Alluvium and Vista Advisory (2019) *Audit of the Water Sharing Plan for the Tweed River Area Unregulated, Regulated and Alluvial Water Sources.* Report prepared by Alluvium Consulting Australia and Vista Advisory for DPIE. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0011/289505/Tweed-River-Area-Unregulated-and-Alluvial-Water-Sources-2010.pdf

104 Alluvium and Vista Advisory (2019) *Audit of the Water Sharing Plan for the Richmond River Area Unregulated, Regulated and Alluvial Water Sources.* Report prepared by Alluvium Consulting Australia and Vista Advisory for DPIE. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0008/289502/Richmond-River-Area-Unregulated,-Regulated-and-Alluvial-Water-Sources-2010.pdf.

105 Alluvium and Vista Advisory (2019) *Audit of the Water Sharing Plan for the Richmond River Area Unregulated, Regulated and Alluvial Water Sources.* Report prepared by Alluvium Consulting Australia and Vista Advisory for DPIE. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0008/289502/Richmond-River-Area-Unregulated,-Regulated-and-Alluvial-Water-Sources-2010.pdf; Alluvium and Vista Advisory (2019) *Audit of the Water Sharing Plan for the Tweed River Area Unregulated, Regulated and Alluvial Water Sources.* Report prepared by Alluvium Consulting Australia and Vista Advisory for DPIE. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0011/289505/Tweed-River-Area-Unregulated-and-Alluvial-Water-Sources-2010.pdf.

Rollout of the *NSW Non-Urban Metering Policy* is underway across NSW, with Stage 4 of the policy applying to coastal areas due for completion December 2023. The metering policy and overarching framework seek to improve the standard and coverage of non-urban water meters in NSW. However, many works in coastal areas are exempt from the metering policy as they are less than 100 millimetres in size. The Commission observed strong support from Richmond and Tweed water users for meter rollout and review of the policy's exemptions for smaller diameter pumps:

> *'A metering/monitoring policy has been put into place in NSW with expected outcomes of 90+% water take measured. The exemption of pumps below 100mm is not helping irrigators. All people in town have meters. Riparian (stock and domestic) users see any unmetered irrigation as potentially impacting their home and livelihood.*
>
> *The current metering policy means that less than 10% of licence holders in the Richmond /Wilson catchment are metered. Irrigators are now drawing a lot of animosity in the community and can't justify to that community that they are doing the right thing'.*[106]

The Plans allow for LTAAELs to be varied based on local water utilities' needs to meet town water supply requirements and to provide for conversion of surface water access licences to high flow access licences (termed high flow conversions) (see **Section 6.3**). This means that the LTAAELs have the potential for growth, without clear consideration for whether this growth is sustainable.

Sustainable LTAAELs are critical to ensure that the needs of the environment are provided for as well as other users. DPIE-Water should review LTAAELs and ensure they are based on best available information, including ecological requirements, hydrological stress and climate change. Such a review may result in new extraction limits.

The Plans should include clear provisions for how any increase in share component would be managed within the LTAAEL. The Plans currently indicate that '*a specific purpose access licence shall not be granted in these water sources unless the Minister is satisfied that the share and extraction component of the access licence is the minimum required to meet the circumstances in which the access licence is proposed to be used'*.[107] This provision should remain and the criteria should be applied to any assessment of whether to increase local utility share component, including the request from Tweed Shire Council.

A range of options could be considered for setting sustainable extraction limits that protect the environment while maximising economic and social outcomes, including setting LTAAELs based on flow classes (low and high flows), particularly given the hydrological stress already observed during periods of low flow. A review of extraction limits should explore the feasibility of such an approach to managing extraction within sustainable limits.

While there are already rules in place that seek to protect environmental values during low flows (for example, cease to pump and pumping restrictions) LTAAELs do not necessarily recognise the timing of extraction, the availability of water and the implications for different flow classes. Setting high and low flow LTAAELs may help to overcome this issue, noting this would require further investigation and consideration of the level of management required compared to the risk and ability to implement effectively. Also, LTAAELs do not recognise that

106 Submission: Individual, received 3 June 2020. Note the Commission was unable to verify the percent of works that are metered raised in this submission but understands that it is likely to be a small percentage.

107 Clause 38 of the Tweed Plan; Clause 50 of the Richmond Plan.

some industries may have the capability to invest in high flow extraction. Allowing trading into high flow would facilitate the market to reduce stress at low flow.

The Plans include AWDs as a tool to respond to growth in use. However, as no numeric LTAAELs have been established, and LTAAEL compliance assessment has not been undertaken, AWDs have been set at 100 percent regardless of the system's ability to provide water.

Establishing sustainable numeric LTAAELs is a recurring recommendation in the Commission's reviews of coastal water sharing plans. In response to this advice, DPIE-Water identified the need to review extraction limits as part of regional water strategies:

> *'Recent investment in new climate and environmental datasets and modelling provide an opportunity to review and update the LTAAELs and water access rules to reflect sustainable levels of extraction. Sustainable extraction limits would consider the ecological, economic, social and cultural water needs of the region'.*[108]

There are several knowledge gaps that should be addressed to inform the development of sustainable numeric LTAAELs in the Plans. For example, in the Richmond Plan area it will be important to develop a better understanding of the Richmond tidal pool's hydrodynamics and instream values in order to determine sustainable levels of extraction from this water source (**Section 6.2**). It will also be important for the LTAAELs to incorporate all forms of extraction, including harvestable rights, particularly given a review of harvestable rights is underway and this may have implications for the volume of water that can be harvested in the plan areas.[109]

5.2 Increasing basic landholder rights extraction must be accounted for

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: [110]

- **Domestic and stock rights –** owners or occupiers of land that 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 –** landholders in most rural areas can collect a proportion of the runoff on their property and store it in one or more farm dams up to a certain size.
- **Native title rights –** 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.

The extent to which basic landholder rights requirements have been met under the Plans is difficult to determine. There is no monitoring of domestic and stock use. Surveillance of harvestable rights dams occurs in some coastal regions, but this is part of the Natural Resource Access Regulator's (NRAR) compliance activities, not active monitoring by DPIE-Water. No volume of water has been determined under native title rights within the Plan areas (see **Section 8.1**).

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108 DPIE-Water (2020) *Draft Regional Water Strategy – Far North Coast,* p. 66. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0017/329012/draft-rws-fnc-strategy.pdf.

109 DPIE-Water (n.d.) *Harvestable rights – dams.* Available at: https://www.industry.nsw.gov.au/water/licensing-trade/landholder-rights/harvestable-rights-dams.

110 Sections 52-55 of the Act.

Stakeholders in both Plan areas raised concerns about growth in basic landholder rights (domestic and stock use) use over the life of the plans associated with land subdivisions placing further pressure on waterways, particularly during times of low flows. The Commission recognises a range of factors could affect low flows. For example, during the 2019-20 drought, both local water utilities and irrigators experienced cease to pump conditions. However, interviewees reported that basic landholder right usage continued as allowed under the Plans, which created tensions in local communities regarding equitable sharing:

> *'In the Richmond, Regulated Water Source there is no allowance made for the increasing number of riparian users. There is now increased small holdings with "hobby farmers" who, by their larger number, are requiring larger amounts of water for stock and domestic use, especially on weekends and holidays. Recent drought has highlighted the reliance of these riparian users on the water that has been released after being ordered by irrigators, sometimes leaving the irrigators at the end of the system short of water. This situation is detrimental to social relationships between licenced extractors who are paying fees for water and their non-licenced neighbours who don't have to pay for the water that they extract.*
>
> *In Unregulated streams there is also an increasing number of house blocks being developed with access to streams. This can cause licenced users to run short of water, with cease to pump trigger points being reached earlier than they have been previously when there were less riparian rights users. This can cause conflict'.*[111]

Both greenfields development and densification will have implications for water use in the Plan areas. Subdivision can result in additional properties accessing river frontage or installing bores for domestic and stock purposes. Data are unavailable on the number of new or projected developments and subdivisions that will rely on basic landholder rights. However, population and housing development patterns, which are growing in parts of the Richmond and Tweed, signal a potential growth in domestic and stock use alongside town water supply. Careful consideration of current and projected development patterns should be considered in the estimation of basic landholder rights requirements going forward.

Basic landholder rights requirements are estimated during the development of water sharing plans. DPIE-Water advised it is currently developing a new basic landholder rights estimates method that will be used for the replacement Plans, which should be available in early 2021. Due to the level of stakeholder concern in the Plan areas, DPIE-Water should undertake regular LTAAEL compliance assessments and ensure that these assessments consider basic landholder rights estimates that have been updated within five years.

The lack of transparent reasonable use guidelines around how much water can be extracted for domestic and stock use through bores or river access[112] is a recurring issue raised in the Commission's reviews. DPIE-Water advised that it is working towards finalising the guidelines, but due to other water reform priorities they are not yet complete.

In its submission, Rous County Council raise the need to address the lack of reasonable use guidelines as a matter of priority:

> *'There are currently no rules or guidelines that govern what is reasonable in terms of the volume and timing of extraction by individual landholders under basic landholder rights. There are no restrictions in place for example in pump size or pipe size and no requirement for meters to*

111 Submission: Richmond and Wilsons Combined Water Users Association, received 12 July 2020.

112 Reasonable use guidelines for domestic consumption and stock watering, as required under Section 336B of the Act.

> *measure the amount of water taken. It follows that there are currently no records of the location and volume of extraction under basic landholder rights in the Richmond River catchment. RCC submits that an accurate understanding of extraction for basic landholder rights is required in order to adequately manage waterways to the benefit of all users including environmental values.*
>
> *RCC has observed the cumulative impact of over extraction on river flow, particularly during dry periods when demand is greatest and flows are at their lowest. The environmental impacts can be numerous and varied and include direct impacts to the biological, chemical and physical properties of aquatic ecosystems and riparian environments. There is a body of evidence that suggests low flows are essential for maintaining water quality, allowing passage over riffles for fish and other fauna to pools used for drought refuge and maintaining productive aquatic ecosystems. It is anticipated that these impacts will increase with increasing population in the Richmond River catchment, increasing extraction rates and climate change factors (e.g. longer dry periods inducing greater demand for water)'.*[113]

All forms of basic landholder rights (harvestable rights, domestic and stock, and native title) must be accounted for as part of Plan LTAAELs and extraction should be monitored. If additional water is captured, it would be lost from downstream environments, licensees and communities and would impact plan outcomes unless another form of entitlement was reduced accordingly.

As part of basic landholder rights, water held in farm dams is only partially regulated by the Plans.[114] Harvestable rights are regulated by the NSW Government Gazette and refer to landholders' right to capture 10 percent of average regional rainwater runoff on their land, with certain limitations.[115] Farm dams also require a licence if they are on a third order or greater stream, a permanent spring fed first or second order stream, or if they exceed the harvestable rights for the property. It is important that DPIE-Water comprehensively assess and manage the environmental risk associated with farm dams and their extraction potential under the replacement Plans.

Some stakeholders called for a review of the harvestable rights for coastal catchments, with some stakeholders considering it should be increased. DPIE-Water is undertaking a review of harvestable rights for coastal draining catchments.[116] The Commission's review has not considered in detail any changes to harvestable rights given the review that is underway by DPIE-Water. However, it is noted that there will be significant variation across catchments in terms of the impacts of increasing harvestable rights on the environment and other users. This variation should be considered as part of DPIE-Water's review, including scenario modelling. A blanket approach of raising harvestable rights will not be fit-for-purpose. Catchment-specific data and modelling of potential impacts is required. This would need to be informed by better knowledge around existing flow and extraction levels within the system, noting the limited metering and monitoring in the area currently.

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113 Submission: Rous County Council, received 3 July 2020.

114 Extraction from a runoff harvesting dam requires an access licence and a water supply works approval, above the landholder's harvestable right entitlement under Section 53 of the Act. If the share components of access licences nominating a runoff harvesting or in-river dam is reduced through a trade, surrender, amendment or cancellation then the Minister may require the dam to be modified to ensure its capacity is reduced (such as through requiring by-pass flows) in line with the reduced share components.

115 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.

116 DPIE-Water (2020) *Harvestable rights – dams*. Available: https://www.industry.nsw.gov.au/water/licensing-trade/landholder-rights/harvestable-rights-dams.

5.3 AWDs can 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, based on the number of unit shares attached to their water access licence. Licensed water users are to have this volume of water credited to their water accounts, which allows them to take this water in accordance with their water account management rules and licence conditions.[117] After the first year, the Richmond and Tweed Plans require that AWDs be made at the commencement of each water year. The Plans include a set of rules that the Minister is to consider when setting the AWD. These rules suggest the AWD should be equal to 1 megalitre per unit of share component for each access licence, or 100 percent of access licence share component, if expressed as a volume.

While the Plans include AWD provisions, these provisions are not being implemented to ensure compliance with LTAAELs (see **Section 5.3.1**). There are also opportunities to expand the use of AWDs to manage water sources in drought periods, which will become increasingly important given climate predictions (see **Section 5.3.2**).

5.3.1 AWDs should be used to ensure LTAAEL compliance

AWDs can be used under the Plan rules to ensure compliance with LTAAELs. If water use exceeds the LTAAEL for an extraction management unit, AWDs can be reduced in the subsequent years to retrospectively address this exceedance. However, AWDs are not currently used for this purpose for these Plans as there has been no assessment of the average annual extraction against LTAAELs. Instead, during the term of the Plans, all categories of access license have received AWDs of 1 ML per unit share or 100 percent per year.[118]

5.3.2 AWDs should be explored as a drought management tool

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 available water during drought, particularly where there is a natural storage capacity (such as the Richmond tidal pool and alluvial aquifers). This will be increasingly important given future climate predictions.

At present AWDs are not used proactively to reduce water allocations during extreme climate events such as drought in the Plan areas. In addition, given the LTAAEL is the sum of all entitlements, it is unlikely that AWDs less than 100 percent or 1 ML per unit share would be triggered under the current Plans. This limits the ability to use AWDs to reduce water allocations during extended drought conditions.

While water sharing provisions, such as cease to pump rules in unregulated rivers contribute to managing water access during times of drought, AWDs should be explored as a tool to better manage extraction during drought. In the tidal pool, AWDs could be issued based on the current volume of the tidal pool and the allocation altered based on inflows. The percentage of tidal pool volume that is allocated could be based on Richmond estuary modelling and cease to

117 WaterNSW (2020) *Available water determinations*. Available at: https://www.industry.nsw.gov.au/water/allocations-availability/allocations/determinations.

118 NSW DoI (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-Various-NSW-Unregulated-and-Alluvial-Water-Sources-No.-2-190701.pdf; DPIE-Water (2019) *Richmond Water Management Area Available Water Determination Summary*. Available at: https://www.industry.nsw.gov.au/water/allocations-availability/water-accounting/historical-available-water-determination-data.

pump conditions would only apply in exceptional circumstances to protect critical needs and drought refugia.

The Commission also considers that, in the longer term, DPIE-Water should consider the possibility of using AWDs to manage water allocation in unregulated systems more broadly during extended droughts, particularly where there is a high ratio of extraction to river flow. While cease to pump rules restrict overall extraction, reducing allocations through AWDs could allow for more effective rationing of water and share the reduction in water more equitably across water users, regardless of their relative position in each water source. While AWDs are currently set annually in most cases, they could be set more frequently as required.

5.4 Recommendations

R 4 – Both Plans	By 1 July 2023, to ensure all extraction under the Plans is managed to protect, preserve and maintain the water sources, aquifer integrity and dependant ecosystems, DPIE-Water should: a) establish and publish fixed, numeric values for LTAAELs, ensuring they are based on best available information, including ecological requirements, an accurate estimate of basic landholder rights and climate change b) investigate the feasibility of setting separate LTAAELs based on high flow and low flow c) undertake regular LTAAEL compliance assessments, ensuring they are underpinned by clear, publicly available procedures requiring consideration of basic landholder rights estimates that are no more than five years old when assessing compliance with extraction limits.
R 5 – Both Plans	By 1 July 2023, DPIE-Water should include rules as necessary following consideration of how AWDs can be used to manage extraction during drought in the Richmond tidal pool and alluvial aquifers including under predicted climate change. This should consider the latest understanding of climate risk based on improved climate data and modelling undertaken to inform the *Far North Coast Regional Water Strategy*.
Suggested Action (SA) A – Both Plans	Finalise the reasonable use guidelines for domestic and stock use by 1 July 2022 and include the agreed standards as part of the replacement Plans.

6 The Plans contain insufficient environmental protections

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.[119]

Water sharing plans have several provisions designed to provide environmental benefits. For example, the Richmond Plan includes cease to pump rules for unregulated water sources that allow for surface water access while there is visible flow or low flow. The Tweed Plan contains similar rules for its unregulated water sources. In the Richmond Regulated Water Source, an environmental contingency allowance (ECA) for Toonumbar Dam was required for the first five years of the plan period. The Richmond Plan also has provisions for visible flow downstream of the dam for domestic and stock purposes.

The Commission found several issues related to environmental provisions in the Plans:

- The Richmond Plan is largely silent on environmental release requirements for local water utilities. ECA releases from Toonumbar Dam do not appear to have been made. While environmental releases have occurred under the Tweed Plan, there are opportunities to improve the design of releases and infrastructure to improve environmental outcomes (**Section 6.1.1**).
- There is a lack of evidence that the provisions to protect the Richmond tidal pool, low flows and threatened native fish are effective. Some rules are impractical to follow and do not reflect best available information (**Sections 6.2, 6.3 and 6.4**).
- The Plans do not adequately manage the risk of disturbing acid sulfate soils, which can impact on water quality (**Section 6.5**).

6.1 Environmental releases are insufficient and require improvement

Environmental release requirements are one of several mechanisms that can help deliver environmental outcomes in the Richmond and Tweed catchments. However, environmental flow rules (operation rules) are suboptimal and have not been effectively implemented, particularly in the Richmond Plan area. Further, the Plan areas have not been monitored for environmental outcomes, making it difficult to assess efficacy of environmental flows.

6.1.1 Environmental releases under the Richmond Plan have been limited

The Richmond Plan area has several water storages, primarily used for town water supply and some irrigation. These include WaterNSW's Toonumbar Dam (11,000 ML), Rous County Council's Rocky Creek (14,000 ML) and Emigrant Creek dams (820 ML), and weirs at Kyogle, Casino and the upper Wilsons River.

The overall environmental condition of the Richmond catchment was found to be poor in an *Ecohealth* assessment report completed in 2015,[120] with bank erosion, poor riparian vegetation and poor water quality in a number of river reaches. Water quality, aquatic macroinvertebrates and geomorphic condition were better in the upper freshwater reaches, compared to lower

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

120 Ryder, D., Mika, S., Richardson, M., Schmidt, J. and Fitzgibbon, B. (2015) *Richmond Ecohealth Project 2014: Assessment of River and Estuarine Condition*. Available at: https://www.ipart.nsw.gov.au/files/5d55f177-6785-4e2b-abea-4314fb4be5eb/Attachment-12.1-UNE-Richmond-Catchment-Ecohealth-Report.pdf

reaches, while the upper estuary had the poorest condition. Modified flow regime, especially during low flows is also listed as a risk. Despite these issues, there are currently very few environmental releases from dams or weirs in the Richmond catchment to improve environmental outcomes downstream. Specific issues related to each dam are discussed in the following sections.

The Commission notes that the poor condition of the Richmond catchment is the result of multiple factors, not just the flow regime. Environmental rehabilitation will require a broader, coordinated approach. For example, in the case of Toonumbar Dam:

> *'More effort is required to achieve an integrated solution beyond simply provision of an environmental contingency allowance. More thoughtful use of [Toonumbar] dam, i.e. negotiations with [WaterNSW] and consideration of regional water network, is recommended rather than just considering the environmental contingency allowance'.*[121]

The implementation of environmental releases as well as improved governance arrangements, will contribute to improved river health. The Commission recommends that an Environmental Flows Reference Group be created to help strengthen governance, strategic planning, and oversight of environmental flow releases across the Richmond catchment to improve environmental outcome. This group at a minimum should include representatives from DPIE-Water, DPIE-EES, DPI-Fisheries, WaterNSW, Rous County Council and local community. When establishing the group, consideration should be given to how it can engage with governance models already being explored to improve river and estuary health as part of the development of coastal management programs.[122] This will help ensure environmental flows complement other measures to improve environmental outcomes.

The Commission understands that DPIE-Water has included an option under the draft *Far North Coast Regional Water Strategy* focus area of 'protecting and enhancing natural systems' to establish and/or increase environmental water releases from major storages in the Far North Coast. The Commission views this as a core requirement of the water sharing Plans, and not an option for the regional strategy. The Plans should clearly establish environmental water needs and rules that protect those needs. Any infrastructure modifications needed to improve environmental outcomes should be identified adequately funded by the NSW Government. The Commission recommends that the Environmental Reference Group should provide guidance for environmental water needs and strategic use of environmental water within the Plans.
As part of the development of a replacement Richmond Plan, DPIE-Water should draw on best available information to determine the environmental flow requirements of key environmental assets and model the impact of low flow periods on connectivity and water quality, including under future climate scenarios. This should be done in conjunction with DPIE-EES, DPI-Fisheries, Rous County Council and WaterNSW. To support the implementation of environmental flow provisions, DPIE-Water should also review the gauging network and ensure there is accurate monitoring of inflows and outflows from storages within the catchment, particularly Emigrant Creek Dam. This should be part of the development of a robust MER framework for the Richmond Plan (see **Section 9**).

Releases from Toonumbar Dam

121 Interview: DPI-Fisheries, 29 July 2020.

122 Alluvium (2019) *Richmond River Governance and Funding Framework*. Available at: https://richmondvalley.nsw.gov.au/wp-content/uploads/2020/02/Richmond-River-Governance-and-Funding-Framework-Final-Report.pdf.

The Richmond Plan allows for an ECA of 1,000 ML to be set aside in Toonumbar Dam and managed according to plan rules until the Richmond Plan's fifth year. However, the recent audit of implementation for the Richmond Plan found no evidence that the ECA was delivered in the first five years.[123] Provisions requiring the establishment of an ECA release program and operations advisory committee (to be chaired by DPIE-EES) were also not given effect.[124]

The Richmond Plan also required a review to identify the environmental assets within the water source and types of critical events that would benefit from an ECA. The Commission found no evidence that a review of the ECA occurred and no subsequent amendment to the plan to extend the ECA beyond five years. In the event no ECA review is undertaken, the Plan required the ECA to be removed to ensure it does not have unjustified socioeconomic impacts. The Commission considers that this may be inconsistent with the priorities of the Act given environmental needs should be prioritised. Also, given that Toonumbar Dam is a significantly underused storage with relatively low irrigation demand, the risk of socioeconomic impacts is low. During the 2019-20 water year, which coincided with drought conditions, water use totalled 2,208 ML.[125]

The lack of ECA releases from Toonumbar Dam may not be significant in wet years, given the dam spills relatively frequently, but it could be significant in dry years. End of system flows as required under Clause 31(2) would also have provided some benefit in the regulated river source in terms of longitudinal connectivity. However, the lack of ECA releases may have impacted water quality and the management of critical events such as algal blooms during drought conditions in 2019-20 when the frequency of spilling rapidly declined. During this period, the ECA could have been used to manage these issues. For example, in January 2020, a red alert warning for blue-green algae was issued for the Richmond River at Casino in the vicinity of Jabour Weir, where sampling showed high levels of a potentially toxic species.[126] The ECA could have potentially been used to mitigate this event. However, the adequacy of the flow for this purpose may have been impacted by high transmission losses to reach this point along the river.

In the absence of a release program, WaterNSW was required under the Richmond Plan and its works approval to provide releases from the ECA account in accordance with direction from the Minister, but there is no evidence that this occurred. Recently, options for a governance and funding framework for delivering improved river health outcomes were developed for the Richmond River.[127] This is a positive step, but the options focus on coastal management

123 Alluvium and Vista Advisory (2019) *Audit of the Water Sharing Plan for the Richmond River Area Unregulated, Regulated and Alluvial Water Sources*. Report prepared by Alluvium Consulting Australia and Vista Advisory for DPIE. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0008/289502/Richmond-River-Area-Unregulated,-Regulated-and-Alluvial-Water-Sources-2010.pdf.

124 Clauses 31(1)(f), (h) and (k). Alluvium and Vista Advisory (2019) *Audit of the Water Sharing Plan for the Richmond River Area Unregulated, Regulated and Alluvial Water Sources*. Report prepared by Alluvium Consulting Australia and Vista Advisory for DPIE. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0008/289502/Richmond-River-Area-Unregulated,-Regulated-and-Alluvial-Water-Sources-2010.pdf.

125 WaterNSW (2020) *Annual compliance report: Richmond regulated river water source 2019 - 20.* Internal report prepared and provided by WaterNSW.

126 WaterNSW (2020) *Blue green algae red alert for Richmond River at Casino, 14 January 2020.* Available at: https://www.waternsw.com.au/about/newsroom/2020/blue-green-algae-red-alert-for-richmond-river-at-casino.

127 This work was funded by DPIE-EES's Coastal and Estuaries Grants Program and the local governments of Ballina Shire, Lismore City, Richmond Valley, Byron Shire, Kyogle and Rous County Council (Alluvium (2019) *Richmond River Governance and Funding Framework*. Available at: https://richmondvalley.nsw.gov.au/wp-content/uploads/2020/02/Richmond-River-Governance-and-Funding-Framework-Final-Report.pdf).

programs to improve estuary health and there is no indication that these options will improve governance of environmental releases.

The Richmond Plan also includes provisions for end of system flows downstream of Toonumbar Dam to the last water supply work on the regulated river.[128] The Commission understands that these flows were delivered, except for a narrow window when valve replacement occurred in 2020. In the last water year, WaterNSW adopted an arbitrary figure of 15 ML per day as a target for end of system flows at Eden Creek at Doubtful River.[129] During the 2019/20 water year a total of 365 ML was delivered as planned environmental water. WaterNSW was informed by a local landholder that there was visible flow at all times during this time. These flows would have benefited domestic and stock users, as well as aquatic ecology. However, the extent of environmental benefit is unclear due to a lack of monitoring.

Environmental releases from Toonumbar Dam should be reviewed as a priority to maximise environmental outcomes downstream. The health of the Richmond River was a key concern of stakeholders, with some raising concerns that the waterways are not being managed effectively.[130] Ballina Shire Council advocates for the Richmond Plan to consider the ecological requirements of a range of water dependent species, not just threatened species.[131] The Commission understands that DPIE-Water has commenced work on determining environmental water requirements for coastal species and considers this a positive step to improve environmental outcomes for the Richmond River.

Another issue to be considered in improving environmental outcomes in the Richmond catchment is thermal pollution. Toonumbar Dam was ranked tenth out of fourteen in NSW in terms of structures likely to cause moderate cold water pollution.[132] The Cold-water Pollution Interagency Group identified Toonumbar Dam as a lower priority for action and consequently funding has not been made available to investigate abatement options.[133] Changes to environmental release rules to improve environmental outcomes downstream of Toonumbar Dam could result in an increase in the occurrence of cold water pollution, depending upon the timing of releases. This should be considered in the design of any release rules.

Toonumbar Dam did not spill during the 2019/20 water year. Water orders and the visible flow maintained in the river during that water year would have provided some environmental benefits. However, better environmental outcomes could have been achieved if the releases more closely mimicked inflows to the dam. It should also be noted that in the future the frequency and magnitude of spill events will potentially decline, placing more pressure on releases for environmental purposes. Climate scenarios should therefore be considered in determining environmental flow rules.

Releases from Rocky Creek Dam

There are currently no provisions in the Richmond Plan or dam licence conditions for environmental flow releases from Rocky Creek Dam, as the dam lacks an outlet to deliver flows,

128 Clause 31(2) of the Richmond Plan.
129 WaterNSW (2020) *Annual compliance report: Richmond regulated river water source 2019 - 20.* Report prepared by WaterNSW.
130 Submission: Individual, received 16 July 2020.
131 Submission: Ballina Shire Council, received 9 July 2020.
132 Preece, R. (2004) *Cold water pollution below dams in New South Wales*. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0004/548518/desktop_assessmnet_cold_water_pollution.pdf.
133 WaterNSW (2020) *Annual compliance report: Richmond regulated river water source 2019 - 20.* Report prepared by WaterNSW.

other than its spillway. Rous County Council advised that dam seepage likely provides some minor aquatic environmental benefit downstream. However, the seepage rate (0.7 ML per day) is estimated to be less than half the volume of natural minimum flows.

The dam is understood to have a significant negative hydrological impact downstream, except for during high flows (greater than 500 ML per day) and the lack of environmental flow provisions is likely impacting the ecological function of the creek. Rous County Council advised that there is potential to ameliorate these impacts through infrastructure modifications, but this could also result in impacts to yield security.

DPIE-Water should work collaboratively with Rous County Council and other key agencies to examine options for improving environmental flows from Rocky Creek Dam and ensure that sufficient environmental flow requirements are included in the replacement Richmond Plan. The long list of options canvassed as part of the draft *Far North Coast Regional Water Strategy* includes an option for establishing and/or increasing environmental releases from major storages in the Far North Coast.[134] This should include Rocky Creek Dam.

Releases from Emigrant Creek Dam

Environmental flow requirements for Emigrant Creek Dam are not reflected in the Richmond Plan, only in licence conditions, reducing transparency around the rules. The rules are meant to reflect inflows into the dam, but there is no monitoring of inflows. As a result, the dam's outlet valve is left open and releases around 0.8 ML per day. The Commission could not find evidence of the basis for these releases. On some occasions this minimum release may be greater than what would occur under natural low flow conditions. At other times, it would be well below recommended minimum flows identified through previous advice on flow scenarios.

A new environmental flow regime, associated infrastructure modifications and inflow and outflow monitoring are required to improve environmental outcomes for downstream aquatic ecosystems. A previous environmental flow study completed in 2001 is still relevant and involved a literature review and field surveys of Emigrant Creek under various flow scenarios.[135] It considered the requirements of key water dependent species including eastern freshwater cod, freshwater herring (*Potamalosa richmondia*), Australian bass (*Percalates novemaculeata*) and platypus (*Ornithorhynchus anatinus*) and proposed a set of environmental flow rules. However, targeted surveys of eastern freshwater cod would be of benefit to determine if the findings from this study should be modified, particularly given there have been no confirmed sightings of eastern freshwater cod downstream of Emigrant Creek Dam.

DPIE-Water should work collaboratively with Rous County Council, who are also investigating options for improving environmental outcomes downstream of Emigrant Creek Dam, to develop appropriate environmental flow rules for inclusion in the replacement Richmond Plan. Previous and ongoing environmental flow studies, as well as town water supply implications for various options should be considered.

6.1.2 Environmental releases in the Tweed can be improved

There is strong support from Tweed Shire Council and other stakeholders for retaining current environmental flows in the Tweed Plan area. The Tweed Plan's operating rules require

134 NSW DPIE (2020) *Draft Regional Water Strategy – Far North Coast: Strategy, October 2020*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0017/329012/draft-rws-fnc-strategy.pdf.

135 Bishop, K.A. (2001) *Emigrant Creek Dam Environmental Flows Investigation*. Report prepared for Rous County Council.

environmental releases from Clarrie Hall Dam (15,000 ML) on Doon Doon Creek (a tributary of the Tweed River) and the Bray Park Weir (520 ML) via the fish ladder at the weir.

While environmental releases are made from these storages in accordance with current operating rules, there are opportunities to improve the design of releases and infrastructure to improve the achievement of environmental outcomes. The outcomes of proposed modifications to Clarrie Hall Dam, the *Bray Park Weir Tidal Protection Project* and the *Far North Coast Regional Water Strategy* will also need to be considered in developing the replacement Tweed Plan. Specific issues related to each structure are discussed in the following sections.

As with the Richmond Plan, there has been limited monitoring of the outcomes (positive or negative) of environmental releases in the Tweed Plan area. Studies have been limited to recent (2019) field surveys in Doon Doon Creek downstream of Clarrie Hall Dam to inform its proposed dam upgrade. During these surveys iron flocs were observed immediately downstream of the dam.[136] Iron flocs can smother macroinvertebrates and obstruct the gills of fish if left to accumulate. The results of these surveys should be considered in development of environmental release rules for the Plan.

Releases from Clarrie Hall Dam

Operating rules in the Tweed Plan requires daily releases from Clarrie Hall dam based on flows at a reference point on the Oxley River. While these requirements have been implemented,[137] there are some issues with current operating rules.

Releases from Clarrie Hall Dam do not mimic natural flow variability. Clarrie Hall Dam does not have release or off-take mechanisms to allow for other than steady small releases, bulk water transfers or spills. The transfer of water from Clarrie Hall Dam to Bray Park Weir is through bulk water transfer. However, the materiality of this issue currently is likely low as between 2008-2019 the dam spilled 66 percent of the time, environmental releases from the dam outlet valve in accordance with the Tweed Plan occurred 38 percent of the time and bulk water releases only occurred 2 percent of the time (note there were occasions where the dam spilled, and releases were simultaneously released from the outlet valve). [138]

While impacts from current provisions are likely minor, a proposal to upgrade Clarrie Hall Dam to a capacity of 42,300 ML[139] could have significant impacts on downstream aquatic health if appropriate environmental flow rules are not built into the Tweed Plan. Specifically, potential reduction in flow modelled in climate change scenarios mean that there may be an increased need for bulk water transfers from the dam. This may increase the frequency and duration of flows less than 90 ML per day.[140] Any modifications should allow for releases that mimic natural flows and potentially improve environmental benefits. Flushing flows downstream will

136 Eco Logical Australia (2019) *Environmental flow assessment raising Clarrie Hall Dam*. Prepared for Tweed Shire Council. Available at: https://www.yoursaytweed.com.au/42403/widgets/232002/documents/108012.

137 The recent Section 44 implementation audit of the Tweed Plan found that these operating rules are reflected in licence conditions and responsibility for their implementation is clear (Alluvium and Vista Advisory (2019) *Audit of the Water Sharing Plan for the Tweed River Area Unregulated, Regulated and Alluvial Water Sources*. Report prepared by Alluvium Consulting Australia and Vista Advisory for DPIE. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0011/289505/Tweed-River-Area-Unregulated-and-Alluvial-Water-Sources-2010.pdf.).

138 Eco Logical Australia (2019) *Environmental flow assessment: raising Clarrie Hall Dam*, p. 72. Available at: https://www.yoursaytweed.com.au/42403/documents/108012.

139 The environmental impact statement for this proposal is expected to be completed in March 2021.

140 Eco Logical Australia (2019) *Environmental Flow Assessment Raising Clarrie Hall Dam*. Available at: https://www.yoursaytweed.com.au/42403/documents/108012.

also be important to address water quality issues in pools downstream of the dam, particularly during spring and summer.

Regardless of the decision regarding dam upgrade, addressing these issues would help to improve downstream environmental outcomes, and enhancements to the infrastructure should be considered.

Releases from Bray Park Weir

The Tweed Plan operating rules require daily releases to be made from Bray Park Weir through the fish ladder.[141] DPI-Fisheries advised that the current Denil design fishway at Bray Park Weir is inadequate and inconsistent with contemporary best practice fishway design standards because it:

- does not effectively pass small bodied fish
- is not suitable for surface swimming fish such as mullet due to high surface velocities
- is susceptible to debris
- has been modified with a flap gate to reduce tidal ingress, impacting its effectiveness.

The operation of the fishway has also been limited by temporary barriers,[142] which are installed by Tweed Shire Council to manage risks around saltwater intrusion into the weir pool.[143] When these temporary barriers are in place, they block the fishway, making it ineffective. These temporary arrangements, while important for protecting town water supply from saltwater contamination, are inconsistent with the Tweed Plan's operating rules.

To manage saltwater intrusion over the longer-term, Tweed Shire Council plans to install a hinged barrier on Bray Park Weir as part of the *Bray Park Weir Tidal Protection Project*. Modifications to the weir would trigger provisions under the *Fisheries Management Act 1994*, including assessment under Section 218 of the *Fisheries Management Act 1994* for a new fishway. The Commission considers this should be a priority. This would need to be coupled with new environmental flow rules, depending upon the design of the fishway, that should be incorporated into the Tweed Plan to ensure there are adequate flows to support native fish populations and associated values (commercial, recreational and tourism). The specifics of these rules will depend on the fishway design that is selected.

Another driver to progress a new fishway design for Bray Park Weir and associated environmental flow rules, is the fish passage offset requirements for the proposed upgrade of Clarrie Hall Dam. The Secretary's environmental assessment requirements for the Clarrie Hall Dam Raising Project stipulates that an assessment of suitable opportunities within the Tweed catchment to offset the impact of the proposed dam upgrade must occur. DPI-Fisheries has advised Tweed Shire Council that Bray Park Weir is the preferred fish passage offset.

It is anticipated that an amendment provision would be required in the Tweed Plan to allow for changes to operating rules for Bray Park Weir to occur once the new fishway design and environmental flow rules are determined. Ideally a technical working group would provide technical expertise on the preferred fishway design and flow rules.

141 Clause 29(3) of the Tweed Plan.

142 The fishway is closed when blocks are placed across the full crest of the weir to prevent saltwater intrusion.

143 Bray Park Weir marks the extent of tidal influence. The tidal influence dominates river levels within the eastern reach of the Tweed River, except during flood events. The weir has been overtopped in recent years and saltwater intrusion poses a risk to town water supply.

6.2 Richmond tidal pool protections should be reviewed

The Richmond tidal pool is a large body of fresh water in the estuary, found between the salt water tidal zone and the freshwater flowing river. The tidal pool and its fisheries are ecologically unique in terms of rarity and representativeness in NSW.

The tidal pool is an important water resource for the region. It is used for domestic and stock purposes and Rous County Council are licensed to extract 5,400 ML per year for town water supply near Lismore on the Wilsons River (Wyrallah Area Water Source). Entitlements for agricultural purposes are extensive, approximately 16,900 ML per year at the commencement of the Richmond Plan. Based on information provided by WaterNSW, 12,892 ML of additional share component has been issued during the life of the Richmond Plan associated with the tidal pool project.[144]

There are several pressures on the tidal pool's ecological and other values, resulting in periods of very poor water quality (low dissolved oxygen, high turbidity and increased nutrient load).[145] The Marine Estate Threat and Risk Assessment indicates that the Richmond is one of a number of estuaries at high risk from modified freshwater inflows including extraction and barriers to riverine and estuarine flows.[146] Land use intensification, riparian clearing, wetland drainage and agriculture related diffuse source run off are also significant threats to the health of the Richmond river and estuary.

The Commission recognises that there are multiple factors that impact on the condition of tidal pools. While inflows are a significant factor influencing environmental outcomes, water sharing rules alone will not be enough to rehabilitate many of the environmental issues. Complementary measures should be considered as part of a broader strategic and integrated catchment management approach (see **Section 10.4**).

The Commission found several issues with plan provisions and management of the Richmond tidal pool, which are discussed in further detail below:

- It is unclear if the Richmond Plan's pumping restrictions and cease to pump rules for the tidal pool are adequate or appropriate to protect instream values and provide suitable water for domestic and stock use and town water supply (**Section 6.2.1**).
- Cease to pump conditions for the tidal pool are impractical to follow (**Section 6.2.2)**.
- Town water supply access conditions differ to other users and lack transparency as they are not codified in the Richmond Plan (**Section** Error! Reference source not found.).
- The basis of a trade in limit for the tidal pool is unclear and requires review (**Section 6.2.3**).

144 This increase is associated with the issuing of water access licenses to tidal pool users under the Act.

145 Ryder, D., Mika, S., Richardson, M., Schmidt, J. and Fitzgibbon, B. (2015) *Richmond Ecohealth Project 2014: Assessment of River and Estuarine Condition. Final Technical Report*. Available at: https://www.ipart.nsw.gov.au/files/5d55f177-6785-4e2b-abea-4314fb4be5eb/Attachment-12.1-UNE-Richmond-Catchment-Ecohealth-Report.pdf.

146 WBM BMT (2017) *NSW Marine Estate Statewide Threat and Risk Assessment Final Report*. Available at: https://www.marine.nsw.gov.au/__data/assets/pdf_file/0010/736921/NSW-Marine-Estate-Threat-and-Risk-Assessment-Final-Report.pdf.

6.2.1 Pumping restrictions and cease to pump rules may be inadequate

The tidal pool is managed in two zones: the Richmond River Tidal Pool Management Zone in the Coraki Water Source, and Wilsons River Tidal Pool Management Zone in the Wyralla Area Water Source. Extraction from each of the tidal pool management zones is based on salinity monitoring at a single gauge located at Coraki (gauge 203403). Clauses 59 and 60 of the Richmond Plan establish:

- pumping restrictions – maximum 10 hours per day when salinity is more than 1 parts per thousand (ppt), but less than 2 ppt
- cease to pump - access licence holders must cease to pump when salinity levels (as measured on the low tide at the reference point) rise above 2 ppt for five consecutive days.

Drought conditions in 2019 and into early 2020 resulted in low river inflows into the Richmond River tidal pool, allowing the freshwater-saltwater interface to progress further upstream. Based on information provided by DPIE-Water, cease to pump conditions during the 2019-20 drought – one of the worst droughts on record for the region – were in place for 13 consecutive days in January 2020 (see **Figure 5**).

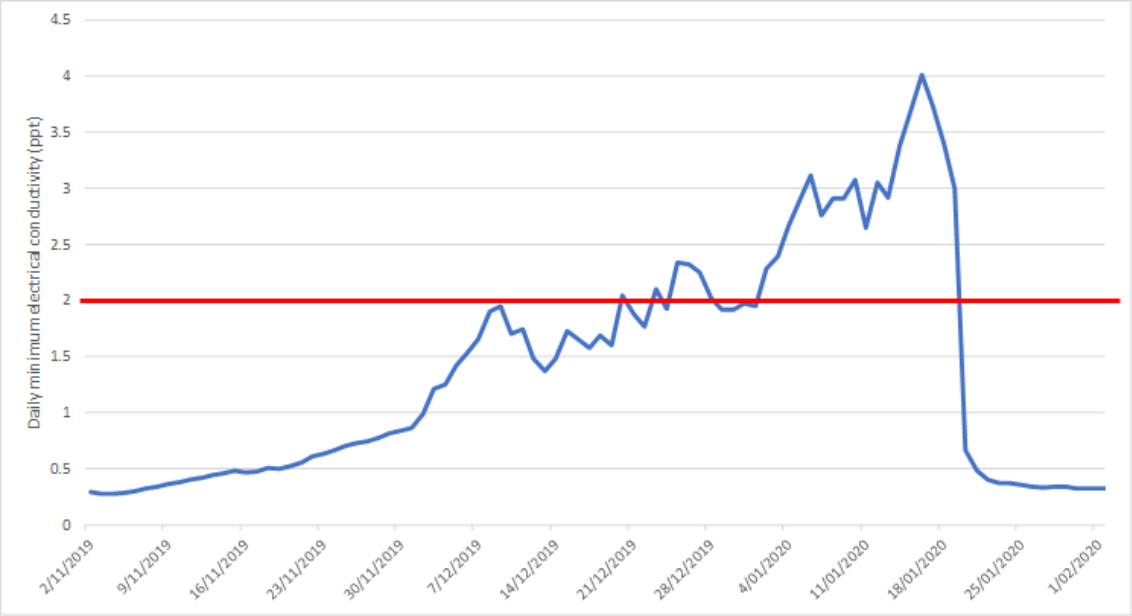

Figure 5: Minimum daily electrical conductivity (ppt) from November 2019 to February 2020 (red line indicates 2 ppt cease to pump level)[147]

It is unclear if the rules were adequate to protect the tidal pool and associated values during the drought, or the extent of compliance with the cease to pump conditions.

The Richmond Plan's background document indicates that '*little [was] known about the impact of salinity increases on ecosystem health*' when the Richmond Plan was developed.[148] There was limited monitoring of salinity, with continuous electrical conductivity sensors installed in the

147 Graph provided by DPIE-Water. Allowing for the 5 five consecutive days rule, the cease to pump conditions should have been activated on 7 January and lifted on 20 January following rainfall.

148 DPI-Water (2016) *Water Sharing Plan for the Richmond River Unregulated, Regulated and Alluvial Water Sources – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166876/richmond-river-unreg-reg-alluvial-background.pdf.

Richmond River at Coraki in October 2009. Prior to that, only opportunistic monitoring had occurred as part of studies undertaken by Rous County Council when the tidal pool was established as a town water supply source. Key gaps in the understanding of the tidal pool and the impact of salinity on instream values and domestic and stock users included:

- a detailed understanding of the tidal pool's instream values
- the tidal pool's hydrodynamics, including its size and vulnerability to change during dry periods and drought
- understanding of connectivity between the tidal pool and groundwater.

The saltwater/freshwater interface delineates the downstream extent of the tidal pool. This interface generally resides around Woodburn but also migrates upstream during dry times and downstream with flood events. The Richmond Plan includes rules that are intended to limit the impact of extraction on the movement of the interface during dry periods.[149] These rules were primarily in response to concerns about the impact of increased salinity on town water supply at the top of the tidal pool.[150]

Based on a study by UNSW Water Research Laboratory, extraction above the 95th percentile poses a high risk to the endangered Oxleyan pygmy perch, platypus, salt sensitive macrophytes, freshwater algae, and school and king prawns.[151] It is currently unclear what percentile the cease to pump rule is based on, but one water user considered it was set at the 99th percentile, which is higher than the state-wide default cease to pump threshold at the 95th percentile.[152]

There is currently no consistent, long-term monitoring of these rules, making it difficult to determine their effectiveness. However, information from DPIE-Water as presented in **Figure 5** above for the height of one of the worst droughts on record shows that the cease to pump threshold may not have been adequate during drought.

Given this uncertainty and the limited evidence available when the Richmond Plan was developed, pumping restrictions and cease to pump rules for the Richmond tidal pool should be reviewed. There are several sources of new information that should be used to analyse the impacts of extraction from the tidal pool on the movement of the salt-freshwater interface, as well as refine the salinity interface percentiles, including:

- The additional 10 years of data from Coraki salinity monitoring station.
- Data from two new continuous salt sensors installed at Oakland Road and Bungawalbin.[153]

149 Pierson, W.L, Bishop K.A., Nittim R. and Chadwick M.J. (1999) *An investigation of the potential impacts of freshwater extraction on the Richmond tidal pool*. Available at: http://unsworks.unsw.edu.au/fapi/datastream/unsworks:43434/SOURCE01?view=true; DPI-Water (2016) *Water Sharing Plan for the Richmond River Unregulated, Regulated and Alluvial Water Sources – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166876/richmond-river-unreg-reg-alluvial-background.pdf.

150 DPI-Water (2016) *Water Sharing Plan for the Richmond River Unregulated, Regulated and Alluvial Water Sources – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166876/richmond-river-unreg-reg-alluvial-background.pdf.

151 WRL (2005) *Rous Water Lismore Source Ecological Impacts of Changed Flow Regimes*. Internal document provided by Rous County Council.

152 Interview: Individuals, 21 July 2020.

153 Interview: DPIE-Water, 29 June 2020.

- The hydrodynamic model of the Richmond estuary developed by the University of NSW's Water Research Laboratory, which is being updated as part of a Marine Estate Management Strategy-funded project to identify priorities for remediation drainage infrastructure in the lower Richmond coastal floodplain. This model and salinity monitoring data could be used to analyse the impacts of extraction from the tidal pool on the movement of the salt-freshwater interface, as well as refine the salinity interface percentiles, and pumping restrictions and cease to pump rules.
- Insights from the 2019-20 drought.
- Any other relevant studies on instream values, their environmental water needs and the impacts of extraction.

The replacement Richmond Plan should also consider the degree of connectedness of the tidal pool and alluvial aquifers. Tidal pools are thought to have a buffering capacity due to groundwater inflows, but this is affected during extended drought conditions.[154] When the Richmond Plan was developed this was a knowledge gap. However, a recent study estimates discharge from the alluvium to the tidal pool at 8.5 ML per day:

> '*Groundwater discharge may be important to sustaining high-value ecosystems in the lower catchment, particularly during periods of drought*'.[155]

6.2.2 Cease to pump conditions for the tidal pool are impractical to follow

Stakeholder submissions expressed concern that salinity monitoring data in the Richmond tidal pool is not easily interpreted. There is confusion over salinity units and the requirement for low tide measurements, making tidal pool access rules difficult to comply with. Real-time data on the WaterNSW website is recorded in different units to the Richmond Plan. Conversion information was not made available online until January 2020 for irrigators to know the equivalent salinity levels in parts per thousand as required under the Richmond Plan. More engagement with water users and notification tools would raise the level of understanding of the Richmond Plan's requirements and likely improve compliance.

In addition to the adequacy of these rules, there are several issues regarding the implementation of the rules that should be considered when reviewing their effectiveness:

- The application of rules between the two tidal pool management zones is potentially inconsistent due to the use of the single monitoring station at Coraki, given the Bungawalbin arm of the tidal pool is naturally more prone to saltwater incursion than the main Richmond/Wilson arm. Submissions noted that water quality (specifically salinity) can be unusable for stock water, but still be legally extracted for irrigation under current Richmond Plan rules.[156] Setting pumping rules that are specific to Bungawalbin and based on the continuous monitoring sensor in Bungawalbin would be logical.
- Town water supply access conditions (Rous County Council) for the tidal pool are based on upstream flow readings at Eltham gauge on the Wilsons River, which is inconsistent

154 DPI-Water (2016) *Water Sharing Plan for the Richmond River Unregulated, Regulated and Alluvial Water Sources – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166876/richmond-river-unreg-reg-alluvial-background.pdf.

155 Napier, M.B. (2017*) An integrated hydrological and hydrochemical study of surface and groundwater s in Bungawalbin Creek catchment, northeast NSW, Australia.* Thesis, Queensland University of Technology. Available at: https://eprints.qut.edu.au/103979/.

156 Submission: Individual, received 5 July 2020.

with the salinity-based rules for other users. The risks and benefits of using a consistent set of metrics for all users should be considered. Conditions that apply to Rous County Council are also not included in the Richmond Plan itself and should be included to promote transparency.

- 'Real time' online data from WaterNSW does not include information on consecutive days or tides. Stakeholders considered it was difficult to interpret the data to understand whether pumping restrictions or cease to pump thresholds had been triggered and were concerned about resulting non-compliance. Stakeholders suggested that a text or email alert service would be useful.

6.2.3 The basis of a trade in limit for the tidal pool is unclear

The Richmond Plan includes trade rules for the tidal pool where a maximum of 2,000 ML of new shares can be traded into the tidal pool management zone (Clause 75(3)(l)). Restrictions on trade are typically adopted to mitigate further hydrological stress or protect instream values. The notion of hydrological stress has not been explored for tidal pools and in this case, there were knowledge gaps regarding instream values at the time of plan development. The trade in limit may also be redundant given the connectivity of the tidal pool with its tributaries. For these reasons, the trade in limit for the tidal pool should be reviewed.

6.3 Provisions to reduce pressure on low flows may not be adequate

Over the life of the water sharing plans, the Richmond and Tweed catchments have experienced extremes in terms of floods and drought. Rainfall in 2019 was amongst the lowest on record since 2002. This corresponded with periods of very low flow and in some cases no flow for some tributaries. In periods of low flow, particularly periods of extended low flow, there is a marked decline in water quality and the availability and condition of aquatic habitat. Extended low flow or cease to flow conditions can result in low dissolved oxygen, temperature extremes and favourable conditions for the development of algal blooms,[157] as was observed at locations in both the Richmond and Tweed catchments during the plan period.[158] Estuarine ecology is also impacted by prolonged periods of reduced inflow.

These periods of low flow may be extended by the impacts of climate change and there is likely to be increased town water requirements as the regional population continues to grow. Climate modelling undertaken to inform the *Far North Coast Regional Water Strategy* indicates that low flows (95th percentile flows) are projected to reduce in magnitude in the region by:

- 9 to 17 percent for unregulated river systems
- up to 12 percent in regulated rivers
- and even more for estuary inflows, as much as 33 percent for the Richmond River estuary.[159]

157 Department of Agriculture and Water Resources (2018) *Characterising the relationship between water quality and quantity*. Available at: https://www.waterquality.gov.au/sites/default/files/documents/characterising.pdf

158 Red alerts (high alerts) for blue-green algae were issued in January 2020 for the Richmond River at Casino (near Jabour Weir) and for Bray Park Weir pool in the Tweed catchment in February 2019.

159 DPIE (2020) *Draft Regional Water Strategy – Far North Coast: strategy*, p. 61. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0017/329012/draft-rws-fnc-strategy.pdf.

Further, the number of years that cease-to-flow events occur is projected to increase across all surface water sources, most notably from 9 percent to 13 percent for inflows to the Tweed estuary.[160] However, the average duration of these events is unlikely to change significantly.

Given the observed extended low flow conditions during the term of the Plans and projected changes in low flows and cease-to-flow based on climate change scenarios, it is critical they include provisions that reduce stress on low flows and that these provisions are effective. The following sections explore the various provisions currently in the Plans that are intended to reduce stress on low flows and their effectiveness to date.

While entitlements for Far North Coast rivers are relatively low in comparison to their average annual flows, annual flows vary significantly, and severe water shortages occur periodically (including during the 2019-20 drought), increasing pressures on low and very low flows.

In coastal catchments, instream values are typically exposed to higher risks associated with extraction of low flows than medium to high flows. Extraction of low flows may influence connectivity, instream pool persistence and water quality, particularly in the lower reaches of the upland areas and within the freshwater tidal pool area. Alteration of natural inflows can also impact estuary health, with desktop studies during the development of the Plans indicating several estuaries were sensitive to low inflows, most notably:

- Richmond Plan area – Lennox Area, Richmond River and Evans River each have a medium sensitivity[161]
- Tweed Plan area – Cobaki Broadwater, Terranora Broadwater, Tweed Estuary have low sensitivity, Mooball Creek has medium sensitivity and Cudgen Lake has high sensitivity.[162]

The Plans include a range of measures to reduce pressure on low flows and protect pools, including cease to pump rules, pump restrictions and high flow conversions.[163] However:

- DPIE-Water advised there has been no uptake of high flow conversions intended to reduce stress on low flows (**Section 6.3.1**).
- There is limited monitoring to understand the adequacy, effectiveness and compliance with cease to pump rules and pump restrictions, and rules may not reflect best available data (**Section 6.3.1**).
- As discussed in **Section 5.2**, there may be growth in basic landholder rights use, which is not covered by cease to pump rules. This extraction is exempt from cease to pump rules and there are no reasonable use guidelines in place for domestic and stock use, so refugia are vulnerable to over pumping. The Commission has previously recommended the need to develop reasonable use guidelines and considers finalising these guidelines should be a priority for DPIE-Water.

160 *Ibid*.

161 DPI Water (2016) *Water Sharing Plan for the Richmond River Unregulated, Regulated and Alluvial Water Sources – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166876/richmond-river-unreg-reg-alluvial-background.pdf.

162 NSW Office of Water (2010) *Water Sharing Plan, Tweed River Area Unregulated and Alluvial Water Sources Background document*. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0004/549418/wsp_tweed_river_background.pdf.

163 Clauses 38(6), 60(5) and 74 in the Richmond Plan; Clause 57 in the Tweed Plan.

These issues increase the risk that low flows and pool refugia for key species that are sensitive to water quality and dependent on pool persistence and low flow habitat are not effectively being protected.

6.3.1 Lack of uptake of high flow conversions to destress low flows

During the development of the Richmond Plan, stakeholders indicated that high flow conversions provided limited incentive to convert to unregulated (high flow) water access licences.[164] The current conversion factor in the Richmond Plan (1:5) was intended to address these concerns. However, many stakeholders still consider the ratio is too low given the significant investment in on-farms storage required to capture high flows and indicate that higher conversion rates need to be investigated.

Other reasons provided by stakeholders for not converting to high flow licences include:

- lack of space and unsuitable terrain to build on-farm storage
- practicality of accessing high flows i.e. it could be cost prohibitive and there could be limited access to power supply
- risks associated with losing pumps in high flows.

A small number of stakeholders also indicated they weren't aware of the opportunity to convert to high flow licences.

The limited uptake of high flow conversions in the Plans means the provision has not been effective in reducing pressure on low flows. In developing the replacement Plans, licence holders should be surveyed to better understand the barriers to high flow conversion uptake. The benefits and likelihood of increased uptake for a range of difference conversion ratios should be assessed.

As discussed in **Section 5.1**, the Plans allow for an increase in LTAAELs to accommodate high flow conversions. The potential risks associated with increased entitlement have not been realised due to the lack of uptake, but could become a material issue if there is a significant uptake of conversions. Assessing options to increase high flow conversion uptake should also consider these risks.

6.3.2 Adequacy and effectiveness of cease to pump rules is unclear

In the unregulated water sources of the Plan areas, flow rules generally allow for access to surface water while there is visible flow or low flow. The low flow cease to pump rules are determined on percentile flows, in line with current practice. The 95th percentile is the default cease to pump in many water sources where there is gauging.

In the Richmond Plan, the cease to pump rules are triggered for low flows ranging from 0 to 15 ML per day at the various reference points across the catchment. No visible flow is used as the cease to pump in water sources where there are no suitable gauges. Within the zone of tidal influence (tidal pools), the cease to pump rule is triggered when salinity levels rise above 2 ppt for more than five consecutive days. Pumping restrictions also apply in six water sources in the

164 DPI-Water (2016) *Water sharing plan for the Richmond Unregulated, Regulated and Alluvial Water Sources: background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166876/richmond-river-unreg-reg-alluvial-background.pdf.

Richmond Plan area. They seek to limit the window when pumping can occur, and are initiated when flows are declining, prior to the cease to pump being triggered. These water sources are where there are a significant number of users.

In the unregulated water sources in the Tweed Valley, the cease to pump rules are triggered for low flows ranging from 0.5 to 6 ML per day at the various reference points across the catchment, pumping is permitted for a maximum of 6 hours per day in the 10-hour window between 7:00 pm and 5:00 am when flows are equal to, or less than, a specified amount at several water sources throughout the catchment. Like the Richmond Plan area, no visible flow is used as the cease to pump where there are no suitable gauges.

The adequacy and effectiveness of these rules is unclear for the following reasons:

- It is difficult to assess compliance with cease to pump conditions as the majority of works in the Richmond and Tweed valleys are unmetered and compliance with visible flow rule is difficult to assess.
- There appears to be uncertainty over when cease to pump condition are in place:

  'Some irrigators were still pumping after the Cease to Pump mechanism (no visible flow) had been reached. It is suggested that there needs to be an active mechanism to advise that pumping should have ceased to remove uncertainty and ensure the environmental flow is sustained during these times'.[165]
- A lack of monitoring of the effectiveness of cease to pump rules to determine opportunities for improvement to better protect low flow habitat.
- across the Richmond and Tweed there are several water sources with a 'no visible flow' rule due to lack of a suitable gauge. This rule only protects pools that remain after rivers have ceased to flow. It does not protect low flows and is difficult to assess compliance. It can also create equity issues for downstream users and may not be appropriate for protecting reaches with high instream values.

The adequacy of existing river gauge network should be reviewed, including whether additional gauges are required to reduce the number of water sources with a 'no visible flow' rule. Consideration should also be given to homogeneity studies, i.e. where flow patterns between water sources can be compared. This approach may identify additional water sources that can be managed from existing gauges where homogenous flow patterns exist.

The Commission understands that additional river gauges were installed in the Richmond and Tweed catchments as part of the Hydrometric Network Expansion Project in 2009 to 2011. However, based on information provided by WaterNSW, not all the new gauges were included in the Plans. Out of seven new gauges installed in the Richmond and Tweed catchments,[166] only three were incorporated into the Plans, most likely because there was insufficient data to accurately rate the gauges.

Cease to pump rules should also be reviewed to ensure they reflect best available information, including additional flow data captured over the life of the plans. An additional ten years of flow data has been collected over the life of the Plans. This may affect the flow duration curves and alter the 95th percentile flows used to set cease to pump rules. Also, in developing the

165 Submission: Ballina Shire Council, received 9 July 2020.

166 Five gauges installed in the Richmond and two installed in the Tweed as part of the Hydrometric Network Expansion project.

replacement Plans, cease to pump rules should be reviewed to ensure they reflect current knowledge of environmental flow requirements of priority water dependent species.

6.4 Protections for threatened native fish need review

The eastern freshwater cod is listed as endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and the NSW *Fisheries Management Act 1994*. It has only been found in the Clarence and Richmond rivers in NSW.

In 2004, the then NSW Fisheries released the *Eastern Freshwater Cod (Maccullochella ikei) Recovery Plan*.[167] Its overall objective was to ensure the recovery and natural viability of eastern freshwater cod populations in their former range in the Clarence and Richmond rivers. The recovery plan required relevant water sharing plans to be consistent with the recovery plan's objectives and recovery actions.[168] This required an understanding of the eastern freshwater cod's flow requirements.

Rules to support the eastern freshwater cod were included the *Water Sharing Plan for the Coopers Creek Water Source 2003*. However, stakeholder concerns and further studies led to refinement of these rules. Rule changes were due to socioeconomic factors and new information on water use and eastern freshwater cod movement. The Coopers Creek Water Source was included in the Richmond Plan in 2016 through plan amendment. Rules included in the Richmond Plan appear less stringent that those in the former Coopers Creek Plan. There has been no monitoring to determine the adequacy of current provisions or whether there is recruitment of eastern freshwater cod.

In 2016, a review of the recovery plan recognised significant progress had been made in implementing recovery actions. However, this review referred to the provisions in the former Coopers Creek water sharing plan, not the less stringent provisions in the amended Richmond Plan. The review also found that further work was required to protect eastern freshwater cod habitat and improve implementation and monitoring of outcomes.[169] The *Priorities Action Statement for the Eastern Freshwater Cod*, which superseded the recovery plan, also calls for further research and monitoring of this threatened species.[170]

Further, new evidence is available on the potential distribution of other threatened species across both the Richmond and Tweed plans that should be considered in the making of new water sharing plans. Since the Plans were gazetted, DPI-Fisheries has developed threatened species distribution mapping using MaxEnt modelling. This constitutes new information that should be considered in any plan remake.

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167 NSW Fisheries (2004) *Eastern (Freshwater) Cod (Maccullochella ike) Recovery Plan*. Available at: https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0009/636399/Eastern-Freshwater-Cod-Recovery-Plan.pdf.

168 DPI-Water (2016) *Water Sharing Plan for the Richmond River Unregulated, Regulated and Alluvial Water Sources – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166876/richmond-river-unreg-reg-alluvial-background.pdf.

169 *Ibid.*

170 DPI (n.d.) *Priorities Action Statement – actions for Eastern Freshwater Cod*. Available at: https://www.dpi.nsw.gov.au/fishing/species-protection/what-current/endangered-species2/eastern-freshwater-cod/priorities-action-statement-actions-for-eastern-freshwater-cod.

The Richmond Plan includes specific cease to pump rules to protect the eastern freshwater cod and provide low flow habitat protection in the Coopers Creek Water Source. These rules have undergone the following changes:

- **Prior to inclusion in the Richmond Plan –** In line with the then NSW *Fisheries Eastern Freshwater Cod Recovery Plan 2004*, cease to pump provisions were included in the *Water Sharing Plan for the Coopers Creek Water Source 2003*. These provisions were then amended in 2009 and 2011. The 2009 amendments were in response to provisions for the eastern freshwater cod being challenged in the Land and Environment Court by the Coopers Creek Water Users Group. The group was concerned about economic impacts arising from cease-to -pump rules. The 2011 amendments were in response to new information, including on:
  - the movement of the eastern freshwater cod
  - improved hydrology
  - a review of the likelihood of cod being present based on fish survey results
  - a water usage survey.

  Changes were also made to provide incentives for water users to move out of the low flow regime (high flow conversions of 1:3). In 2011, specific plan objectives for the eastern freshwater cod were also included.[171]
- **After inclusion in the Richmond Plan –** In 2016, the merging of Coopers Creek Water Source into the Richmond Plan saw less stringent cease to pump rules for the Coopers Creek Water Source than were in the Coopers Creek Plan. Most notably, a lower cease to pump threshold of 9 ML per day at Ewing Bridge gauge (203024) (cease to pump rule based on 95th percentile to be consistent with neighboring water sources). The specific plan objectives for the eastern freshwater cod do not appear to have been carried across to the Richmond Plan, although the broader objective to 'protect, preserve, maintain and enhance the important river flow dependent and high priority groundwater dependent ecosystems of these water source' may still be relevant to the eastern freshwater cod.[172]

While the new, more relaxed cease to pump rules in the Coopers Creek Water Source are consistent with neighboring water sources (such as Terania Creek) and statewide default cease to pump policy, there is limited information to determine whether the changes are suitable for eastern freshwater cod and protecting low flow habitats.

In its annual reviews of threatened species lists, the NSW Fisheries Scientific Committee identified the need to prioritise systematic monitoring of existing eastern freshwater cod populations.[173] There have been no systematic surveys of eastern freshwater cod since the Richmond Plan commenced. Some opportunistic sampling has occurred, but the last sampling event was in 2009. Without targeted monitoring, it is difficult to determine whether a viable population exists in the Richmond river catchment, including whether there is recruitment and whether environmental flow provisions are effective. Understanding these impacts is particularly important to manage risks from potential growth in basic landholder extraction (which does not have a cease to pump) resulting from increased subdivisions in the Richmond area.

171 Including to '*protect very low flows for fundamental ecosystem health and pools for drought refuge*' and '*provide flows that facilitate passage of the Eastern Freshwater Cod*' (Clauses 11(e) and 11(f) in the Coppers Creek Plan)

172 Objective 10(a) of the Richmond Plan.

173 DPI (2016) *Review of the Eastern Freshwater Cod Recovery Plan*. Available at: https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/683026/review-of-the-eastern-freshwater-cod-recovery-plan-.pdf.

In addition, DPI-Fisheries has developed new threatened species distribution mapping since the Plans were developed, which shows the modelled potential distribution of threatened native fish.[174] This mapping indicates that, in addition to the eastern freshwater cod in the Richmond Catchment, Oxleyan pygmy perch have the potential to be found in the lowland coastal fringe of the Richmond catchment, as well as southern purple-spotted gudgeon in the Richmond and Tweed catchments. Both the Oxleyan pygmy perch and southern purple-spotted gudgeon are listed as endangered under the *Fisheries Management Act 1994*. The Oxleyan pygmy perch is also listed as endangered under the *Environment Protection and Biodiversity Conservation Act 1999*. Their water requirements should be considered in the Plans.

The potential distribution of the Oxleyan pygmy perch in the lowland coastal fringe waterways may require consideration of the extent that these waterways are groundwater fed and require provisions that prevent drawdown of off-river and on-river pools.

Targeted surveys should be undertaken to confirm the nature of existing populations of threatened native fish species and their recruitment, particularly eastern freshwater cod. The water requirements of these species (and other priority water dependent species such as Australian Bass and the large-footed myotis bat (*Myotis macropus*) should be determined and considered in developing plan provisions.

There is also an opportunity to broaden amendment provisions based on a better understanding of environmental needs. The Richmond Plan currently includes amendment provisions in Clause 82(2)(h), but this is limited to the eastern freshwater cod. This potentially restricts the consideration of new information on other important water dependent species/ecological assets in the Plan areas.

6.5 The Plans do not adequately manage acid sulfate soil risks

Acid sulfate soils are naturally occurring sediments and soils that contain iron sulfides (principally pyrite), leading to the generation of sulfuric acid when exposed to oxygen.[175] If left undisturbed and below the groundwater table, these soils are benign.[176] However, if exposed to oxygen through activities such as drainage works and groundwater extraction, they can generate sulfuric acid and have significant impacts on water quality and aquatic biota downstream, and result in fish kills. This can also lead to contamination of groundwater, affect pastoral land and result in economic impacts.

Acid sulfate soils are present in the Plan areas, mainly on the coastal floodplain. The *Marine Estate Management Strategy Threat and Risk Assessment* identified the Plan areas at high environmental risk from extraction and modified flows, with major impacts from acid sulfate soil leaching and reduced pH almost certain to occur.[177] The Tuckean Area Water Source in the Richmond Plan is particularly vulnerable, due to its extensive drainage network on the

174 DPI (2016) *Threatened species distribution maps*. Available at: https://www.dpi.nsw.gov.au/fishing/threatened-species/threatened-species-distributions-in-nsw.

175 NSW Parliament (2016) *Water Sharing Plan for the Macleay Unregulated and Alluvial Water Sources 2016*. Available at: https://www.legislation.nsw.gov.au/view/html/inforce/current/sl-2016-0385.

176 Michael, P. (2013) Ecological impacts and management of acid sulphate soil: a review. *Asian Journal of Water, Environment and Pollution*, 10(4), pp. 13-24.

177 Fletcher, M. and Fisk, G. (2017) *NSW Marine Estate Statewide Threat and Risk Assessment*, p. 15. Available: https://www.marine.nsw.gov.au/__data/assets/pdf_file/0010/736921/NSW-Marine-Estate-Threat-and-Risk-Assessment-Final-Report.pdf.

floodplain.[178] Recent field observations identified extensive deposits of monosulfide black ooze, high surface water acidity (pH <5) and discharge of iron floc plumes into the Richmond River.[179]

The Act requires that plan provisions, particularly relating to water use and aquifer interference, deal with matters such as the occurrence of acidity.[180] Unlike more recently gazetted water sharing plans, such as the *Water Sharing Plan for the Macleay Unregulated and Alluvial Water Sources 2016*, the Plans and background documents do not recognise the significance of risks associated with acid sulfate soil disturbance and do not include provisions to mitigate these risks.

The Plans do not refer to acid sulfate soil mapping or the need to maintain water tables to reduce the risk of disturbing acid sulfate soils. As a result, water supply works approvals are currently being granted for works in high risk areas for acid sulfate soils, risking soil disturbance and subsequent water quality issues associated with acidic discharge:

> *'A landholder at Dungarubba has recently been granted a licence to pump groundwater within the now drained former Tuckean Swamp. The property is located on Class 3 Acid Sulfate Soils whereby works likely to result in disturbance of soil or drawdown of groundwater from 1 metre below the surface requires a development application. The purpose of this requirement is to reduce the acidification of the soil profile and reduce export of water that is low in pH. Over time, oxidation of soils in this area will acidify recharging groundwater as well as resulting in acidic surface water discharge after rainfall events. Water licensing must consider these serious environmental considerations in their approvals'.*[181]

The replacement Plans should include a definition of acid sulfate soils and provisions to manage acid sulfate soil risks. The *Water Sharing Plan for the Macleay Unregulated and Alluvial Water Sources 2016* should be drawn upon in developing these. Acid sulfate soil risks maps should be referenced in the replacement plans to allow stakeholders to identify acid sulfate soil hotspots.

6.6 Recommendations

R 6 – Richmond Plan	By 1 July 2023, to improve environmental flow rules in the Richmond Plan for infrastructure where environmental releases are currently not provided for or are suboptimal, DPIE-Water should: a) use best available information to determine suitable, outcomes-focused environmental flow regimes for all dams and weirs, and ensure these are reflected in Plan rules and licence conditions b) establish an Environmental Flows Reference Group[182] within a year of Plan commencement to strengthen governance, strategic planning, and oversight of environmental flow releases across the Richmond catchment to improve environmental outcome. The group as a minimum should include representatives from DPIE-Water, DPIE-Environment, Energy and Science (EES), the Department of Primary Industries (DPI)-Fisheries, WaterNSW, Rous County Council and local community. The group should engage with the governance model adopted as part of the

178 Roach, A.C. (1997) The effect of acid water inflow on estuarine benthic and fish communities in the Richmond River, NSW. *Australasian Journal of Ecotoxicology*, 3 (1), pp. 25–56.

179 Rayner, D.S., Harrison, A.J. and Glamour, W.C. (2020) *Tuckean swamp hydrologic options study*. Available at: https://ozfish.org.au/wp-content/uploads/2020/03/WRL-TR2019-21-FINAL-DRAFT-JANUARY-2020_COMPRESSED.pdf.

180 Clauses 5(4)(a) and 5(8)(a) of the Act.

181 Submission: Ballina Shire Council, received 9 July 2020.

182 To replace the Environmental Contingency Allowance Operations Advisory Committee.

	Richmond Coastal Management Program to ensure there are shared objectives and outcomes (where appropriate). c) review the gauging network and ensure there is accurate monitoring of inflows and outflows from storages within the catchment, including Emigrant Dam Creek as a priority and include appropriate flow reference points in the Plan.
R 7 – Tweed Plan	By 1 July 2023, to improve the management of environmental releases under the Tweed Plan, DPIE-Water should: a) amend the Plan if necessary to allow changes to operational rules for Clarrie Hall Dam and Bray Park Weir based on the outcomes of investigations as part of the proposed augmentation of Clarrie Hall Dam, Bray Park Weir Tidal Protection Project (including fishway design) and *Far North Coast Regional Water Strategy*. b) implement revised environmental flow rules for Clarrie Hall Dam and Bray Park Weir (via fishway) based on best available information regarding the water requirements of key environmental assets, including, but not limited to native fish.
R 8 – Richmond Plan	By 1 July 2023, to improve the management of the Richmond tidal pool, DPIE-Water should: a) analyse salinity data from continuous monitoring stations and run scenarios through updated Richmond hydrodynamic and salinity models to better understand the impacts of extraction on the movement of the salt-freshwater interface b) review available evidence to better understand instream values and their environmental needs and the impacts of extraction c) refine cease to pump thresholds and pumping restrictions based on (a) and (b) to better protect environmental values d) include town water supply access rules for the Wilsons River Water Source and ensure these align with access rules for other users e) review the trading rules for the tidal pool, including the trade-in limit of 2000 megalitres (ML) and the validity of the management zones approach where no trades are allowed between management zones.
R 9 – Both Plans	By 1 July 2023, to reduce pressure on low flows, DPIE-Water should: a) determine if amendments to Plan provisions are required to encourage high flow conversions, where appropriate, by: i. determining a target for high flow conversions that could achieve a material benefit through destressing the low flow regime, but not compromising high flow dependent values ii. assessing barriers and drivers for uptake of high flow conversion b) improve understanding of the environmental flow requirements of priority water dependent species in unregulated water sources, including low flow requirements – cease to pump rules should be reviewed based on this information and updated flow data c) review the adequacy of existing river gauge network and whether additional gauges are required to reduce the number of water sources with a 'no visible flow' rule.
R 10 – Both Plans	By 1 July 2023, to improve outcomes for native fish, DPIE-Water should collaborate with DPI-Fisheries to: a) improve understanding of native fish populations and whether recruitment is occurring through targeted surveys of eastern freshwater cod (Richmond Plan area), southern purple-spotted gudgeon and Oxleyan pygmy perch (both plan areas) b) update Plan provisions based on best available information, including fish flow requirements (including to achieve fish passage), key fish habitat mapping, new listings of threatened native fish and DPI-Fisheries' threatened species distribution mapping c) include amendment provisions in the replacement Plans allowing updates to Plan rules based on new data for a broad range of water-dependent species.

R 11 – Both Plans	By 1 July 2023, to improve mitigation of acid sulfate soil risks, DPIE-Water should: a) include a definition and provisions to manage the risk of disturbance of acid sulfate soils, consistent with those in the *Water Sharing Plan for the Macleay Unregulated and Alluvial Water Sources 2016* b) ensure Plans cross-reference online Acid Sulfate Soil Risk Maps so water users can identify at risk areas.
SA B – Both Plans	Support complementary measures such as riparian rehabilitation, streambank stabilisation and improved fish passage. Ensure these measures are considered in an integrated way with the Plans.
SA C – Richmond Plan	By the end of 2022, DPIE-Water should collaborate with WaterNSW to adopt a simpler notification system (consider text message) for Richmond tidal pool users to inform them about when pumping restrictions and cease to pump conditions are in place.
SA D – Richmond Plan	Tweed Shire Council should establish a Technical Working Group to advise on options for a new fishway at Bray Park Weir and associated operating requirements to deliver better environmental outcomes for native fish.

7 Spatial variation in values and connectivity is not considered

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

- the consideration of connectivity between water sources
- access licence dealing rules, which encourage trading of water access licenses to the highest value use within sustainability and system constraints
- rules to protect groundwater dependent ecosystems across different parts of the Plan area.

The Commission found the following:

- The Plans need to more effectively protect highly connected surface-groundwater systems, drawing on best available information and additional studies where appropriate (**Sections 7.1** and **7.2**).
- Trade rules are complex and may unnecessarily inhibit trade. Mapping errors in the Richmond Plan create barriers to trade, and support mechanisms for trade can be improved across both Plans (**Sections 7.3, 7.4** and **7.5**).
- Groundwater dependent ecosystems should be reviewed to reflect best available data and clarify links to the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* (**Sections 7.6**).

7.1 Consideration of connectivity is currently limited

7.1.1 Richmond and Tweed water sharing plans require clear definitions

The Plans consider connectivity between surface water and groundwater sources to some extent. Both plans were underpinned by the principles of the macro water planning approach, which recognises that most alluvial groundwater sources are connected with their associated surface water sources and should be covered by a single water sharing plan.[183] As part of the macro planning process, surface and groundwater connectivity was considered when setting plan rules with the intention of limiting the impact of groundwater extraction on surface water flows. In addition, both plans included an objective consistent with the National Water Initiative 2004 that '*provides recognition of the connectivity between surface water and groundwater.*'[184]

However, the Plans do not appear to adequately manage connected water sources and lack a clear definition of surface-groundwater connectivity. Of note, the application of cease to pump rules to alluvial bores within 40 metres of streams does not recognise that there are likely to be areas beyond this distance where alluvial aquifers can still be highly connected to surface water and should be managed accordingly via linked access rules. This is in part attributed to the simplified and standardised rule-setting approach for coastal areas under the macro planning framework. However, the framework does recognise that local conditions still can be

183 DPI-Water (2015) *Macro water sharing plans: the approach for groundwater*. Available at: https://www.water.nsw.gov.au/__data/assets/pdf_file/0019/547300/macro-water-sharing-plans-the-approach-for-groundwater.pdf.

184 Clause 10(h) in the Plans.

considered (as is the case for the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*).[185] However, in the case of the Richmond and Tweed Plans, local conditions do not appear to have been considered to date to develop tailored local rules for managing surface-groundwater connectivity.

The Plans should include clear definitions of connectivity to provide greater clarity around plan objectives and associated strategies that relate to maintaining and protecting connectivity. The definition should recognise both the discharge of groundwater to surface water and surface water leakage (recharge) to shallow groundwater systems. Consideration of both directions of flux should be included in the Plans with the river and alluvial system managed as a connected water source. Plan rules should also reflect the temporal and spatial variability in connectivity, acknowledging that some areas are more connected than others and have different travel times.

7.1.2 Better understand and manage connectivity

When the Plans were developed, an assessment was made of the level of connection of surface water and groundwater from different aquifer types. The coastal sands and upriver alluvial were determined to have significant connection.[186] However, there were knowledge gaps in the evidence base underpinning these assessments and a lack of monitoring limited the confidence in these assessments. As a result, there is a risk that the level of connectedness may be underrepresented for some aquifer types that could potentially contribute to river base flow. This issue was raised by stakeholders:

> '*Assumptions about interconnectivity of groundwater and surface water sources are based on a simplified, macro view of geology, soil and vegetation across the region and sub-regions rather than on the local environment. As a consequence, the current water sharing plan assumes that interconnectivity between surface water and fractured rock (those areas covered by the North Coast Fractured and Porous Rock Groundwater Sources water sharing plan) is only "low to moderate" which cannot be scientifically justified. The data do not exist*'.[187]

There have been few studies in the Tweed Plan area, with stakeholders expressing concern around the lack of scientific data:

> '*There is a lack of scientific data of both above ground & groundwater sources in the Tweed which means the current Water Sharing Plan, is ineffective for future decisions on water licensing. This needs to be remedied (& funded) as soon as possible, and Climate change uncertainty needs to be taken into account*'.[188]

There have been several studies in the Richmond Plan area[189] but they do not appear to have been incorporated into the Richmond Plan and knowledge gaps remain. Several of these studies

185 DPI-Water (2015) *Macro water sharing plans: the approach for groundwater*. Available at: https://www.water.nsw.gov.au/__data/assets/pdf_file/0019/547300/macro-water-sharing-plans-the-approach-for-groundwater.pdf.

186 DPI-Water (2016) *Water sharing plan for the Richmond River Unregulated, Regulated and Alluvial Water Sources.* Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166876/richmond-river-unreg-reg-alluvial-background.pdf; DPI-Water (2010) *Water sharing plan for the Tweed River Area Unregulated, Regulated and Alluvial Water Sources.* Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0004/549418/wsp_tweed_river_background.pdf.

187 Submission: Tweed Water Alliance, received 3 July 2020.

188 Submissions: Northern River Guardian Incorporated, received 3 July 2020, and individual submissions received 2 July 2020 and 28 June 2020.

189 See: Brodie, R.S. (2007) *Conjunctive Water Management in the Lower Richmond Catchment Thesis (PhD)*, Australian National University, Canberra. p. 347 ; Drury, L.W. (1982) *Hydrogeology and Quaternary stratigraphy of the Richmond River valley, New South Wales*, School of Applied Geology, University of NSW; Sammut, J., White, I.

have formed part of coal seam gas exploration in the Richmond catchment. Of note, one study attempted to identify river reaches that are gaining groundwater and found high spatial and temporal variability in gaining river reaches.[190] It also found that groundwater contribution in surface waters was notably higher post flood (by 14 to 24 percent) than in baseflow or moderate flow conditions, reinforcing the need to manage the Richmond alluvial aquifers and surface waters as a connected system.

The need for more robust scientific data on connectivity was also raised in a review by the NSW Chief Scientist and Engineer to address community concerns around extraction by the water bottling industry (see **Box 1** for more detail). In particular, the review called for further studies and use of existing data on variability in groundwater sources and connectivity, as well as more consideration of climate change through hydrological models.[191]

Current surface water access rules (including cease to pump rules) in the Richmond and Tweed Plans also apply to alluvial bores within 40 meters of the high bank of a river.[192] This approach recognises the connectivity between surface water and groundwater. However, there are no linked access rules for any bores more than 40 meters from rivers, even in highly connected systems where there is potential for these bores to impact on streamflow. Further, the rules for bores within 40 metres of the high bank of the river only applied to extraction from alluvial aquifers from the sixth year of the plans for both the Richmond and Tweed Plans. Access rules were staged to manage the impact of stricter access rules.

The Plans also allow for conversion of unregulated river access licences to alluvial access licences,[193] potentially encouraging more extraction into the alluvial zone in areas that may be highly connected. Recognising the benefits of water users being able convert licences, highly connected areas may be at risk. This risk could be managed if linked access rules (cease to pump rules) were updated to apply beyond 40 metres of the high bank of the river.

In the Richmond plan area, alluvial groundwater licences occur mainly along the main trunk of the Richmond River (Kyogle Area Water Source) and on the Richmond Floodplain in the Coraki Area and Wyrallah Area water sources.[194] Some tributaries along the Richmond River also

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and Melville, M.D. (1996) 'Acidification of an estuarine tributary in eastern Australia due to drainage of acid sulfate soils'. *Marine and Freshwater Research* 47(5), pp. 669–684; Sundaram, B., Feitz, A.J., De Caritat Plazinska, A., Brodie, R.S., Coram, J. and Ransley, T. (2009) *Groundwater Sampling and Analysis – A field Guide;* Santos, I.R. and Eyre, B.D. (2011) 'Radon tracing of groundwater discharge into an Australian estuary surrounded by coastal acid sulphate soils'. *Journal of Hydrology*, 396, pp. 246–257; Santos, I.R., deWeys, J. and Eyre, B.D. (2011) 'Groundwater or floodwater? Assessing the pathways of metal exports from a coastal acid sulphate soil catchment'. *Environmental Science & Technology*, 45, pp. 9641–9648; Davis, R. (2012) *Assessing groundwater-surface water exchange in creeks from a coal seam gas area near Casino, New South Wales using Radon*. Unpublished Third Year Undergraduate Report. School of Environment, Science & Engineering, Southern Cross University, Lismore.

190 Atkins, M.L., Santos, I.R. and Maher, D.T. (2016) Assessing groundwater-surface water connectivity using radon and major ions prior to coal seam gas development (Richmond River Catchment, Australia*), Applied Geochemistry*, 73, pp: 35 – 48. Available at: https://www.sciencedirect.com/science/article/abs/pii/S0883292716301597

191 NSW Chief Scientist & Engineer (2019) *Independent review of the impacts of the bottled water industry on groundwater resources in the Northern Rivers region of NSW - Final Report* Available at: https://www.chiefscientist.nsw.gov.au/__data/assets/pdf_file/0019/285040/Final-Report_Northern-Rivers-Bottled-Water-Review.pdf.

192 Clause 61 of the Richmond and Clause 44 of the Tweed Plan.

193 Part 11, Clause 57(2) in Tweed Plan and Clause 74(2) in Richmond Plan.

194 DPI-Water (2016) *Water Sharing Plan – Richmond River Area unregulated, regulated and alluvial water sources: Background document* p.17. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166876/richmond-river-unreg-reg-alluvial-background.pdf.

include areas of alluvial floodplain.[195] The upriver alluvium accounts for around 60 percent of all alluvial aquifer licences and the downstream floodplain alluvium accounts for around 40 percent of alluvial access licences. In 2008, an embargo was placed on the granting of new access licences in the alluvial aquifers in the Richmond Plan area.[196] The background document did not indicate the reason for the embargo, but it is assumed that the system was determined to be fully allocated.

Groundwater extraction from bores more than 40 meters from river could have a degrading influence on streams in periods of low flow threatening the water-dependent species that rely on them, a concern raised by several stakeholders. Further, potential inequities occur in highly connected systems requiring those within 40 metres of the river to cease pumping due to potential impacts to the river flow, while allowing those beyond 40 metres to pump. Some stakeholders were particularly concerned about the water bottling industry extraction:

> '*During droughts, restrictions to reduce access/cease and to pump, should also apply to all five water extraction and water bottling plants within Tweed Shire who are taking water from aquifers, when there are low flows in nearby creeks and rivers*'.[197]

The NSW Chief Scientist and Engineer's review of the water bottling industry found no evidence that current bottled water extractions have impacts on other properties' bores, surface water or groundwater dependent ecosystems in the Northern Rivers region (see **Box 1** for more detail). This review did conclude that robust assessment of potential connectivity between aquifers and overlying shallow groundwater and surface water was critical as there is potential for deeper aquifers to be connected to surface water sources.[198] This has been observed in Alstonville, where the aquifer is unconfined. Studies showed the aquifers of the Alstonville Basalt, as well as North Coast Fractured Rocks, can maintain perennial streams.[199]

In developing the replacement Plans, DPIE-Water should consider surface-groundwater studies and DPIE-EES soil landscape mapping to improve understanding of connectivity.[200] Where appropriate, DPIE Water should prioritise conducting connectivity studies to inform plan provisions based on the risks and values to surface water sources. For example, as noted in **Section 7.2**, there are perceived risks to Emigrant Creek and Marom Creek in the Richmond Plan area, warranting further studies on the extent of connectivity. Submissions also indicated that Youngmans Creek, which feeds Tuckean Swamp should also be investigated (see **Section 7.6.2**). Connectivity studies should also be prioritised for areas where there is a relatively high

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195 See Appendix 1 of the Richmond Plan.

196 DPI-Water (2016) *Water Sharing Plan – Richmond River Area unregulated, regulated and alluvial water sources: Background document* p.17. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166876/richmond-river-unreg-reg-alluvial-background.pdf.

197 Submission: Tweed Shires Water Strategies Project Review Group, received 2 July 2020.

198 NSW Chief Scientist and Engineer (2019) *Independent review of the impacts of the bottled water industry on groundwater resources in the Northern Rivers region of NSW - Final Report.* Available at: https://www.chiefscientist.nsw.gov.au/__data/assets/pdf_file/0019/285040/Final-Report_Northern-Rivers-Bottled-Water-Review.pdf.

199 Brodie, R., Sundaram, B., Tottenham R., Hostetler, S. and Ransley, T. (2007) *An overview of tools for assessing groundwater-surface water connectivity.* Bureau of Rural Sciences, Canberra.

200 Surface groundwater connectivity studies should consider all alluvial aquifers which may be impacted by extraction as raised in the NSW Chief Scientist and Engineer's report '*Robust local assessment of potential connectivity between aquifer and overlying shallow groundwater and surface water should form part of pump tests and feature in hydrogeological reports. This is important, as observed in Alstonville, where deeper aquifers are not necessarily confined and may have connections to surface systems or shallower aquifers. It is important to increase understanding of how confined the aquifer is, as assessment criteria of allowable drawdown differs between confined and unconfined systems. In addition, field verification is an important part of the process*'.

density of bores (outside 40 m) nearby water sources with high instream values to determine the extent of connectivity and possible risks that groundwater extraction pose to these values.

Connectivity studies should inform review of water access rules (particularly expanding cease to pump rules beyond 40 metres) for areas that are identified as highly connected to ensure rules are consistently applied across connected surface and groundwater sources. Access rules should be revised to include new bore licences beyond 40 metres from the high bank of a river for areas that are identified as highly connected and access rules for existing bores should be revised as appropriate in a staged approach. The socioeconomic impacts of extending exemption outside the 40-metre distance on industries relying on groundwater, and the potential for compensation to be triggered should be investigated (see **Chapter 11**).

As part of robust MER programs for the Plans (see **Chapter 9**), metering and monitoring all extraction bores (including for domestic and stock) should be encouraged to facilitate accurate records of groundwater take and assessment against sustainable extraction limits. This information needs to be reported regularly and made publicly available.

Box 1 – Water bottling in the Northern Rivers region

There are seven bottled water operators in the Northern Rivers region with allocations of 270 ML per year (less than one percent of water licences and basic landholder rights and 0.008 percent of the estimated total annual aquifer recharge).[201] There are four proposed operations that would, if approved, be able to extract an additional 168 ML per year. Like other commercial (non-agricultural) users, these operators must have approval under the *Environmental Planning and Assessment Act 1979*.

Over three quarters of bottled water is sourced from underground wells, the remainder from standard reticulated water supplies. Stakeholders have raised concerns around extraction from groundwater sources by the bottled water industry, particularly around perceived over extraction and exemptions from cease to pump rules.

To address community concerns, potential over extraction by the bottling industry was reviewed by the NSW Chief Scientist and Engineer in 2019.[202] The review analysed various growth scenarios in the bottled water industry. While the most likely scenario suggests the industry will grow at less than 2 percent per year to 2024, the review also analysed growth to 2034 for the industry, including 'highly unlikely' (growth continuing at current rate of 10 percent) and 'extremely unlikely' (establishment of major premium bottled water exporter in the Northern rivers) growth scenarios to 2034.

The review found that, even under highly and extremely unlikely scenarios, there was no evidence at that time that current water sharing plan extraction limits are not sustainable. The review did not find that the process of allocation or the volumetric take of groundwater should be of regionally significant concern:

> *'Based on the review of available information, there is no measured evidence that current bottled water extractions have impacts on other properties' bores, surface water or GDEs in the Northern Rivers region. This is at least partly due to the relatively low current levels of extractions, hydrogeological conditions and lack of monitoring detecting these impacts'.*

201 NSW Chief Scientist and Engineer (2019) *Independent review of the impacts of the bottled water industry on groundwater resources in the Northern Rivers region of NSW - Final Report* Available at: https://www.chiefscientist.nsw.gov.au/__data/assets/pdf_file/0019/285040/Final-Report_Northern-Rivers-Bottled-Water-Review.pdf.

202 NSW Chief Scientist and Engineer (2019) *Independent review of the impacts of the bottled water industry on groundwater resources in the Northern Rivers region of NSW - Final Report* Available at: https://www.chiefscientist.nsw.gov.au/__data/assets/pdf_file/0019/285040/Final-Report_Northern-Rivers-Bottled-Water-Review.pdf.

The review also acknowledged that in groundwater studies and management, there will always be a level of uncertainty associated with predictions (for example, for recharge rates) and a precise value may not be achieved due to the complex and heterogeneous nature of groundwater movement. This is particularly evident in fractured rock systems that are difficult to characterise fully. Nonetheless knowledge gaps should be addressed where practical.

The review recognised that there are significant knowledge gaps around sustainable levels of groundwater extraction and there is still little ongoing monitoring or metering of groundwater take across Plan areas. It was also noted that local studies suggested periods of low rainfall and increased extraction may lead to impacts on ecosystems when they are under stress and a comprehensive monitoring network is required to evaluate and assess local impacts.

> *'Making water extraction and monitoring data available in standardised formats through open databases would benefit decision-makers, researchers and the general public to understand better activities and impacts, including cumulative impacts at local and regional scale. Approvals by relevant state and local government authorities could include requirements that all hydrogeological data are published. There are state managed environmental databases (e.g. SEED) that could be utilised.'*

Improving monitoring and evaluation of groundwater, including the impacts of extraction from industries such as bottling is important to accurately understand the impact of extraction and the adequacy of water sharing plan provisions. Transparently reporting the findings of future monitoring would go some way to addressing stakeholder concerns and strengthen trust in water sharing plan provisions.

7.2 Extraction from the Alstonville Plateau may impact Richmond Plan water sources

The Alstonville Basalt Plateau Groundwater Source is currently managed under the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016*. While managed under a separate plan, the aquifers of the Alstonville Basalt, as well as the North Coast Fractured Rocks (composed of fractured basalts) provide significant baseflow to streams managed under the Richmond Plan,[203] including those that feed Marom Creek Weir and Emigrant Dam. There is limited recognition and management of this connectivity in the Richmond Plan or the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016*.

In addition, the Tuckean Area Water Source, which includes the high priority groundwater dependent ecosystem, Tuckean Swamp, is also fed by streams that originate on the Alstonville Plateau. Stakeholders communicated that:

> '*Floodplain drainage is particularly pertinent to the ongoing survival of this area and water licensing for extraction both adjacent the wetland and in upstream … catchments should consider this as integral to the availability of calculated recharge amounts*'.[204]

The Alstonville Basalt Plateau Groundwater Source is considered fully allocated[205] and is classified as a highly stressed system.[206] While no new licences can be allocated in this water

[203] Brodie, R., Sundaram, B., Tottenham R., Hostetler, S. and Ransley, T. (2007) *An overview of tools for assessing groundwater-surface water connectivity.* Bureau of Rural Sciences, Canberra.

[204] Submission: Ballina Shire Council, received 9 July 2020

[205] DPI-Water (2017) *Groundwater extraction in the New South Wales Northern Rivers*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0003/215760/Interim-report-on-the-impacts-of-the-bottled-water-industry-on-groundwater-sources.pdf.

[206] Department of Land and Water Conservation (1998) *Aquifer risk assessment report. NSW Department of Land and Water Conservation.* New South Wales Government, Sydney.

source, permanent trade is allowed. Stakeholders have raised concerns regarding the increasing use of groundwater on the Plateau for irrigation of tree crops, particularly macadamias, and recent applications for new water bottling operations. There is also concern that potential extraction from the Plateau for town water supply will impact connected streams in the Richmond Plan area.

Like much of the Plan area, there are knowledge gaps around the nature and extent of connectivity between the Alstonville Basalt Plateau Groundwater Source and water sources in the Richmond Plan area, and whether changes to plan provisions are required to maintain and protect this connectivity. Stakeholders raised concerns around the lack of data underpinning surface groundwater connectivity creating a risk that Plan provisions do not adequately protect groundwater systems (see **Section 7.1.2**). DPIE-Water should further investigate the connection between these sources and consider whether changes to the provisions in the Richmond Plan or the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* are warranted. A review of trade within Alstonville may be warranted once additional investigations are complete. The Plans should clearly acknowledge any connectivity between them.

7.3 Trade rules are complex and may unnecessarily inhibit trade

The Plans aim to maximise the social and economic benefits of water use while protecting environmental, cultural and social outcomes.[207] They include:

- objectives to provide opportunities for enhanced market-based trading of access licences and water allocations within environmental and system constraints[208]
- dealing rules (hereafter referred to as trade rules) intended to encourage movement of water to the highest value use, while protecting the environmental health of the water source and preventing over-extraction.[209]

The Plans' trading rules were developed as part of the macro planning process[210] and in line with the *Access Dealing Principles Order 2004*. The Order requires rules to meet environmental requirements,[211] and prevent adverse impacts on basic landholder rights and features of major cultural, heritage or spiritual significance.[212] Trade is prohibited into water sources with high instream values, while hydrologic stress is also considered in trading rules.

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207 The objective of trading is to help maximise social and economic benefits of access licences for the community as required under the objects of the Act - see *Access Licence Dealing Principles Order 2004,* Clause 10.

208 Clause 10(e) of the Plans.

209 Part 11 of the Plans establish a system for licence dealings in the respective plan areas.

210 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.

211 As summarised from *Access Licence Dealing Principles Order 2004,* Clause 7, 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; not increase commitments to extract above sustainable levels identified in the Plan.

212 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).

Trade rules are based on ecological value and hydrologic stress. When it was developed, the Richmond Plan had ten unregulated water sources and one regulated water source with high instream values and the Tweed Plan had two water sources with high instream values. Trading into these water sources was restricted. In addition, in high environmental value management zones, the daily access rules (cease to pump thresholds) were more stringent than water sources with lower in stream values.[213]

There are several factors that influence trade in the Plan areas, including the relatively high rainfall received in these catchments and crop demand. Irrigation is generally used to supplement rainfall, with increased demand for water triggered by drought.[214]

The Commission identified several issues that may inhibit effectiveness and efficiency of trade provisions. These include:

- the scale of management is not targeted appropriately for maximising effective outcomes
- trade rules are complex and confusing for licence holders, which may inhibit trades
- trade provisions are not based on the latest available HEVAE mapping, which identifies high ecological valued areas.

The Commission reviewed the WaterNSW trade data for the Plans, which indicated that there is limited trade or demand is low within the Plan areas.[215] While it is not an objective to maximise the number of trades, the limited trade may mean that the provisions unnecessarily inhibit trade and therefore trade provisions should be investigated.

7.3.1 Reconsider the scale of management to better support the water market

Water sharing plans typically use a hierarchy of management scales from extraction management units (generally catchments), to water sources (sub-catchments), to management zones (smaller sections of a sub-catchment warranting specific management). In most water sharing plans, trade rules are based on the water source scale, with specific exclusions for management zones.

In general, within water sharing plans, trading is permitted within water sources subject to assessment and restrictions on trading between certain management zones. Some trading is also permitted between certain water sources within the same extraction management unit, but this is typically subject to additional assessments or restrictions. Water access licences cannot be traded between extraction management units in coastal water sharing plans.

For the Richmond Plan, WaterNSW advised that share components are set at the whole of water source level making trade between management zones difficult to determine. This has created difficulties for processing trades, particularly in the tidal and non-tidal management zones of

213 DPI-Water (2016) *Water Sharing Plan for the Richmond River Unregulated, Regulated and Alluvial Water Sources – Background document for amended plan 2016*, p. 44. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166876/richmond-river-unreg-reg-alluvial-background.pdf; NSW Office of Water (2010) *Water Sharing Plan, Tweed River Area Unregulated and Alluvial Water Sources Background document*, p. 19. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0004/549418/wsp_tweed_river_background.pdf.

214 Aither (2019) *Water Market Intelligence Final Report prepared for the Natural Resources Access Regulator*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0018/271422/NRAR-market-intelligence-report-August-2019.pdf.

215 WaterNSW (2020) *NSW Water Register*, accessed January 2020. Available at: https://waterregister.waternsw.com.au/water-register-frame.

the Richmond Plan. WaterNSW and other stakeholders raised that trade rules for the Bungawalbin Creek and Coraki Area water source are confusing and should be reviewed to assist agencies manage and support trade.

In 2011, after additional studies and an interagency panel review, the Richmond Plan was amended to prohibit the trade of licenses between the Upper and Lower Management Zones, and from the tributaries to the main trunk of Coopers Creek. These rules were designed to protect instream values, including eastern freshwater cod habitat, from the pressures of additional extraction and recognised that further degradation due to increased stress from extraction is undesirable.[216]

The Tweed Plan manages the trade of alluvial groundwater licenses with the same trading rules as the adjoining surface water. The rules allow trade, where permitted between water sources, only from a river alluvial area to another river alluvial area.[217]

In the Plan remake, DPIE-Water should reconsider the scale of mapping of water sources and management zones based on a consistent hierarchy. If this is not practical, provisions should be designed at the appropriate geographic scale and clearly stated in the Plan to avoid unintended barriers to trade. Links between the intended objectives, location of high economic and environmental values, and Plan provisions should be clearly communicated.

7.3.2 Trade rules should be simplified and relaxed where appropriate

The trade rules in both plans are complicated and quite limiting. This was raised by several stakeholders who found the trade rules too restrictive and complex. In particular, the Richmond Plan lacks a clear breakdown into management zones, making dealings difficult and confusing. The current wording in the Richmond Plan is also construed as prohibiting trade between tidal pool management zones. Trade restrictions may also have been a barrier to high flow conversions, which are designed to reduce pressure on low flows (see **Section 6.3**). There are opportunities to relax trading rules to enhance economic outcomes while maintaining environmental and social outcomes, particularly between the connected tidal pool management zones. For clarity and ease of implementation, DPIE-Water should include volumetric trade limits for each water management zone in both Plans.

Some licence holders expressed an interest in increased flexibility for water trade, particularly in the Richmond plan area. For example, it was suggested that this could be achieved by broadening the areas where trade can occur. Some stakeholders indicated that it would be beneficial to manage the tidal pool as a single trading zone. Other stakeholders were concerned about allowing trades in areas already under hydrological stress:

> *'Trading should not be allowed into areas that cannot sustain the additional extraction'.*[218]

DPIE-Water advised that it is advancing methods for reviewing trade rules in unregulated rivers, which will be piloted in coastal and inland areas. The Commission welcomes this project.

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216 DPI-Water (2016) *Water Sharing Plan for the Richmond River Unregulated, Regulated and Alluvial Water Sources – Background document for amended plan 2016*, p. 44. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166876/richmond-river-unreg-reg-alluvial-background.pdf.

217 NSW Office of Water (2010) *Water Sharing Plan, Tweed River Area Unregulated and Alluvial Water Sources Background document*, p. 19. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0004/549418/wsp_tweed_river_background.pdf.

218 Submission: Toonumbar Water Users Association, received 5 July 2020.

DPIE-Water recently updated its high instream value (HEVAE) mapping for the Richmond and Tweed catchments and will use this information with the latest metrics on hydrological stress to assess water source risk and review trade rules. Care should be taken when considering any revisions to trade rules to identify potential perverse or unintended outcomes. In review the trade rules DPIE-Water should review where rules can be simplified and made more flexible, without inhibiting environmental outcomes.

By 1 July 2023, DPIE-Water should use best available evidence, including HEVAE mapping, to reassess the environmental values of all management zones/water sources in the Plans. Where necessary they should then amend the Plans' rules to address any changes to classifications and ensure that the high value environmental ecosystems are protected by the Plan rules, without unnecessarily inhibiting trade.

7.4 Mapping errors create unintended barriers to trade

Stakeholders raised several anomalies in the mapping and descriptions of the Richmond Plan's water source boundaries and management zones. For example:

> *'Some licence holders have found that streams on their properties have been included in the wrong catchment areas and this can have implications for trading and pumping rules'.*[219]

In the Richmond Plan, Bungawalbin Creek is included in the Coraki Area Water Source, even though it has its own distinct subcatchment and salinity regime. The Richmond Plan includes several restrictions on trades into Bungawalbin Creek that require review. Further, the tidal limit on Bungawalbin Creek on the upstream of the boundary of the water source is not represented as the tidal pool zone in spatial mapping. WaterNSW advised that a water user needed to withdraw an application for trade due to this difference. Bungawalbin Creek is also spelt incorrectly in the Richmond Plan ('Bungawalbyn').

Stakeholders also raised concerns with the mapping of the Wyrallah Area Water Source and the Coraki Area Water Source. Trading is not permitted between these water sources, despite them being part of the same tidal pool and managed under the same access rules. This issue should be reviewed as part of the replacement Richmond Plan to ensure that there are no unnecessary barriers to trade.

There are also inconsistencies on individual water access licences that need to be addressed, with one example of a licence assigned to Bangalow Area Water Source when it appears to be in the Coraki Area. As a result, the licence cannot be traded within the correct water source. These mapping errors have significant real-world economic implications for licence holders and should be addressed as a matter of urgency.

7.5 Support mechanisms for trade can be improved

There are several issues regarding the implementation of trade rules that should be addressed when implementing the replacement Plans:

- **Administrative arrangements limit dealings and create unintended barriers –** Some stakeholders advised that the management of trades is complex and difficult due to a lack of clarity in trade rules, which causes delays and unintended barriers to trade. For

219 Submission: Individual, received 5 July 2020.

example, Richmond Plan trades are set by the sum of share components at plan commencement rather than an upper limit that cannot be exceeded as used in more recent plans. WaterNSW advised that an additional 60 water access licenses were granted in 2012 in the Richmond tidal pool, and there is confusion as to whether these are included in the original plan sum of share components. This should be clarified in the replacement Richmond Plan.

The National Water Initiative agreement requires the progressive removal of barriers to trade in water to facilitate the broadening and deepening of the water market.[220] The timeliness of trades is critical for irrigators in times of drought. If trades are delayed due to administrative issues, there can be significant economic ramifications for businesses. For example, one stakeholder group advised that they were aware of some trades that took up to six months to process. Ideally trades should be able to be completed within one week.[221]

During the 2019 drought, some irrigators ran out of water to feed cattle, water crops, or wash down dairies. Being able to transfer water between properties or with other irrigators quickly could have alleviated this economic stress. To improve social and economic outcomes DPIE-Water should review the timing limitations of trades with key stakeholders to accelerate trade approvals processes as a matter of priority.

- **Price reporting has been inaccurate –** trading is intended to move water to the highest value use, with the cost of water therefore tracking scarcity and potential intended uses. Many trades have no costs assigned, limiting the information available to the market to support growth.[222] WaterNSW has recently updated their trade application form to require the inclusion of costs, though cannot require costs to be accurately entered.[223]

  Any actions to strengthen trade must protect environmental outcomes in line with the Act's water management principles. As discussed in previous reviews,[224] the Commission suggests that DPIE-Water should continue to implement their program to improve all trade information, including coordination with relevant agencies to:

  - publish a transparent overarching process for assessing trades for approval
  - increase education and awareness of trading arrangements, including the use of metering to increase trade opportunities
  - investigate trade drivers and barriers through stakeholder engagement processes, including with Aboriginal stakeholders.

220 Commonwealth of Australia (2018) *National Water Initiative*. Clause 23 (v) Available at: http://www.agriculture.gov.au/water/policy/nwi.

221 Interview: Combined Richmond and Wilsons Water Users Association, 30 July 2020.

222 In the 2016-17 Australian Water Markets Report, ABARES reports that 74 percent of entitlement trade transactions in unregulated surface water systems outside the Murray-Darling Basin record a $0 transaction, while 100 percent of allocation trade transactions in unregulated surface water systems outside the Murray-Darling Basin record a $0 transaction. Most trades in the Plans had a zero value assigned.

223 WaterNSW (2020) *Water Allocation trade form update – fact sheet*. Available at: https://www.waternsw.com.au/__data/assets/pdf_file/0008/158939/Water-Trade-Form-Update-Factsheet-FINAL.pdf

224 See previous commission reports at Natural Resources Commission (2021) *Water Sharing Plan Reviews*. Available at: https://www.nrc.nsw.gov.au/wsp-reviews.

7.6 Protections for GDEs can improve

In line with plan objectives, the Plans have provisions to protect identified high priority GDEs.[225] Each Plan is required to include a schedule of identified GDEs. When the plans commenced, no high priority GDEs were identified in the Tweed Plan and one high priority GDE was listed in the Richmond Plan – Tuckean Swamp.[226] Although the extent to which the swamp should be managed under the Richmond Plan is unclear (see **Section 7.6.2**), it includes provisions to protect Tuckean Swamp, including restrictions on the construction of groundwater bores within specified distances of the GDE.

Since the Plans commenced, no additional GDEs have been added to the Plan registers. DPIE-Water advised that no new GDEs have been identified in the Plan areas.

The management of GDEs in both plans can be improved by:

- using more up to date GDE definitions to classify GDEs and including culturally significant sites in the definition (**Section 7.6.1**)
- reviewing and clarifying the management of Tuckean Swamp (**Section 7.6.2**)
- aligning plan provisions with the *NSW Aquifer Interference Policy* and the provisions of the *Water Sharing Plan for the North Coast Coastal Sands Groundwater Sources 2016* (the North Coast Coastal Sands Plan) (**Section 7.6.3**).

7.6.1 GDE definitions and classifications are outdated

Advancements in the definition and methods to identify high priority GDEs since the plans commenced mean that current classifications should be reviewed to ensure all high priority GDEs are identified and managed appropriately.

The Plans currently define high priority GDEs as '*ecosystems which have their species composition and natural ecological processes wholly or partially determined by groundwater*'.[227] While this reflects the then Department of Land and Water Conservation's definition,[228] DPIE-Water adopted the following updated definition in 2016, based on the Australian Government's Department of Environment and Energy:

> *'Ecosystems that require access to groundwater to meet all or some of their water requirements so as to maintain their communities of plants and animals, ecological processes and ecosystem services'*.[229]

This definition also aligns with definitions used in national approaches for identifying GDEs for protection, including the National Groundwater Dependent Ecosystem Atlas[230] and the GDE

225 Objective 10(a) in both Plans is to 10(a) to '*protect, preserve, maintain and enhance the important river flow dependent and high priority groundwater dependent ecosystems of these water sources*'.

226 Schedule 6 (Table 2) and Appendix 4 of the Richmond Plan.

227 Schedule 1 of the Plans.

228 Department of Land and Water Conservation (2002) *The NSW State Groundwater Dependent Ecosystems Policy – a component policy of the NSW State groundwater policy framework document*. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0005/547844/groundwater_dependent_ecosystem_policy_300402.pdf.

229 NSW Office of Water (2016) *Methods for the identification of high probability groundwater dependent ecosystems*. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0011/691868/High-Probability-GDE-method-report.pdf.

230 Australian Government Bureau of Meteorology (n.d.) *Groundwater Dependent Ecosystems Atlas*. Available at: http://www.bom.gov.au/water/groundwater/gde/map.shtml.

Tool Box.[231] It encompasses a greater range of potential high priority GDEs and should be included in the replacement Plans.

DPIE-Water has advanced the methodology for identifying high priority GDEs since the Plans were developed.[232] The new method involves an ecological values assessment based on four criteria and associated attributes from the HEVAE framework (naturalness, distinctiveness, vital habitat, and diversity). It does not cover all potential GDEs (including ecosystems living in the aquifer such as stygofauna, and ecosystems supported by discharging groundwater to surface such as wetlands and river baseflow), with more work required to identify all types of groundwater dependent wetlands.

The Commission understands that the National GDE Atlas, which is a central repository of GDE data, will be updated with new information from state government agencies on GDEs. In contrast, the GDE Atlas shows several moderate to high potential GDEs in Queensland's Gold Coast region, which is close to the Plan areas. While this data is drawn from regional studies, given the proximity to the Plan areas and the common basalt caldera geology, further local studies should be undertaken to determine if there are GDEs are worth considering.

The Plans include amendment provisions to incorporate newly identified high priority GDEs, and potential GDEs added to the register and considered in works approvals. These provisions should be retained in the replacement Plans and used to incorporate newly identified GDEs over the plan period. DPIE-Water should consider administration systems that trigger for amendments to be undertaken to enable adaptive management. To improve transparency, newly identified GDEs should be added to the GDE Schedule and Plans within 6 months of confirmation of their dependency.

The Plans currently only have specific provisions to protect high priority GDEs (if identified), whereas low and medium priority ecosystems are considered in other legislation, such as the *Environmental Planning and Assessment Act 1979*. The Plans should clarify terminology and the extent of protection of low and medium priority groundwater dependent ecosystems where appropriate in Plan attachments. This is important given the classification of high priority or high ecological value ecosystems is inconsistent across policies. It is important for DPIE-Water to identify which type of GDEs are present across the Plan areas as they require different management approaches. This could include for example, including definitions of high value and high priority GDEs in the Plan dictionaries.

GDE objectives and definitions should include culturally significant sites to ensure their protection. The Plans prevent approval of water supply works for basic landholder rights within 100 metres, or 200 metres for any other use, of groundwater dependent culturally significant sites.[233] DPIE-Water should work with the Aboriginal community and Traditional Owners to further expand on culturally significant groundwater sites and values and include mechanisms to support Aboriginal involvement throughout the process.

231 Sinclair Knight Merz (2011) *Australian groundwater dependent ecosystem toolbox part 1: assessment framework*. Available at: http://www.bom.gov.au/water/groundwater/gde/GDEToolbox_PartOne_Assessment-Framework.pdf.

232 DPI-Water (2016) *Methods for the identification of high probability groundwater dependent vegetation ecosystems*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0010/151894/High-Probability-GDE-method-report.pdf.

233 Clause 54 of the Tweed Plan and Clause 71 of the Richmond Plan.

7.6.2 Tuckean Swamp management should be reviewed and clarified

Tuckean Swamp is a large estuarine back-swamp within the Richmond Floodplain. It has been highly modified with construction of drains and a tidal barrage, which has – among other issues – lowered the shallow water table and resulted in exposure of acid sulfate soils and acid leachate. This has caused the degradation of pastoral land and impacts on the aquatic environment (see **Section 6.5** for further discussion of acid sulphate soils). Despite this modification, Tuckean Swamp remains an important economic and environmental resource for the region. The area is valued for its agricultural, biodiversity and cultural values, and part of the Tuckean Swamp is now protected as a nature reserve.[234]

While Tuckean Swamp is listed as a high priority GDE in the Richmond Plan, a large proportion of its area is actually located in the Richmond Coastal Sands Groundwater Source and managed under the North Coast Coastal Sands Plan, which also lists Tuckean Swamp as a high priority GDE.

A review of the Richmond Plan area maps indicates that Tuckean Swamp may still rely in part on groundwater from the Richmond to recharge, and if so, the Richmond Plan provisions remain key to protecting the GDE. The boundaries of the Richmond coastal sands in the Richmond Plan and Richmond Coastal Sands Groundwater Source (below the tidal limit) in the North Coast Coastal Sands Plan should be reviewed to determine if Tuckean Swamp remains a relevant GDE for the Richmond Plan and ensure that provisions protect it accordingly.

If Tuckean Swamp requires protection under the Richmond Plan, the extent to which Tuckean Swamp is managed by the Richmond Plan should be clearly outlined in the Plan schedule and map. The Richmond and North Coast Coastal Sands Plans should also indicate how they work together to manage risks to the GDE, including how the impacts of overlapping provisions will be assessed and ensuring water access rules comply with GDE plan provision requirements.

A review of the management of Tuckean Swamp should also consider the findings of recent studies highlighting options to restore water levels in the swamp to improve water quality and mitigate the impact of acid generation and runoff. For example, a 2020 study by the Water Research Laboratory worked with landholders and stakeholders to prioritise areas affected by acid generation across Tuckean Swamp, develop restoration options and model management scenarios. The study found that hinging open the barrage gates to allow broadscale reintroduction of tidal flows to the swamp in desirable periods would help manage the impacts of acid sulfate soils. However, this may impact upon salinity of water used by landholders for cropping. While the outcome of the study is outside the scope of the replacement Richmond Plan, the implementation of preferred options may have implications for provisions. Any changes to provisions should involve consultation with water user groups and key stakeholders.

234 DPI-Water (2016) *Water Sharing Plan for the Richmond River Unregulated and Alluvial Water Sources -Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166876/richmond-river-unreg-reg-alluvial-background.pdf.

7.6.3 Setback distances should be reviewed

The *NSW Aquifer Interference Policy*[235] is designed to holistically protect GDEs, considering both potential water level and quality impacts.[236] It outlines a comprehensive approach to GDE 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 entire water source.
The Plans include rules concerning water supply works approvals near GDEs, specifically a range of setback distances for work near GDEs.[237] Set back distances aim to minimise the potential impacts of groundwater extraction on environmental features, including GDEs. The Plans also have provisions for the Minister to require the proponent to submit a hydrogeological study to demonstrate there will be minimal or no greater impact on GDEs.

The current setback distances in the Plans appear to align with the *NSW Aquifer Interference Policy*. However, the setback distances in the Richmond Plan designed to protect high priority GDEs could be aligned with the setbacks in the North Coast Coastal Sands Plan, which are more stringent for protection high priority GDEs. Provisions should be retained that give the Minister discretion to vary these distances, provided adequate studies are undertaken.

Setback distances in the North Coast Coastal Sands Plan do not allow works within 100 metres of a high priority GDE.[238] For works required for basic landholder rights taking of up to 20 ML per water year may be allowed within 400 metres of a high priority GDE.[239] In contrast, water supply works for basic landholder purposes in the Richmond Plan are allowed within 100 metres of a high priority GDE and works not solely used for basic landholder rights purposes are allowed within 200 metres of a high priority GDE.[240] This means that different rules apply to bores that could be located near Tuckean Swamp depending on the groundwater source and the water sharing plan they are governed by. To adequately protect Tuckean Swamp and ensure equity, the North Coast Coastal Sands GDE provisions and Richmond Plan GDE provisions should align.

235 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.
236 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.
237 Clauses 70 and 71 of the Richmond Plan and Clauses 53 and 54 of the Tweed Plan.
238 Clause 41 (2a) of the North Coast Coastal Sands Plan.
239 Clause 41 (2b) of the North Coast Coastal Sands Plan.
240 Clause 70(1)(a) and 70(1)(b) of the Richmond Plan.

7.7 Recommendations

R 12 – Both Plans	By 1 July 2023, to improve the management of connectivity, DPIE-Water should: a) draw on best available information and conduct relevant studies to identify highly connected systems, including but not limited to the relationship between Alstonville Plateau groundwater and base flow in connected waterways in the Richmond Plan area b) revise access rules accordingly to include new bore licences beyond 40 metres from the high bank of a river for areas that are identified as highly connected in 12(a) and stage access rules for existing bores c) include comprehensive definitions for surface-groundwater connectivity in the Plan dictionaries.
R 13 – Both Plans	By 1 July 2023, to support economic outcomes, while protecting high-value aquatic ecosystems, DPIE-Water should use best available evidence to review trade arrangements under the Plans, including: a) considering latest HEVAE mapping and risk assessments b) assessing the full range of economic benefits and impacts of water extraction and the importance of river health to industries and supporting a range of ecosystem services such as tourism, recreation and community activities c) reviewing and addressing trade barriers, such as mapping errors (noting that environmental outcomes must be maintained) d) working with WaterNSW to address ambiguity in trade rules and improve administrative arrangements to enable timely trades e) amending Plan rules, where necessary, to address any changes to classifications.
R 14 – Both Plans	By 1 July 2023, to improve the management of GDEs, DPIE-Water should: a) map and ground-truth the presence and extent of GDEs, including estuarine and coastal ecosystems and define their groundwater requirements b) clearly define groundwater terms and their relevance to the Plans, including GDE priority and types (including high-priority GDEs) c) review setback distances for work near identified GDEs and standardise them based on the *NSW Aquifer Interference Policy 2012* and more stringent setback distances in the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater* d) clarify the extent to which Tuckean Swamp is managed by the Richmond Plan and ensure provisions reflect the requirements in the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016*, where supported by best available information.

8 The Plans do not support outcomes for Aboriginal people

The Plans include three objectives to support Aboriginal water values as part of the prioritisation of water users under the Act:[241]

- protect, preserve, maintain or enhance the Aboriginal, cultural and heritage values of these water sources
- protect basic landholder rights, including native title rights
- manage these water sources to ensure equitable sharing between users (equity relates to the appropriate prioritisation of different licence classes under the Act).[242]

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

- All current Native Title, Native Title claimants and Indigenous Land Use Agreement[243] holders need to be consistently acknowledged across both Plans. Relying on basic landholder rights or the Commonwealth *Native Title Act 1993* to provide for these water rights without identifying or estimating the water requirements is inherently problematic (**Section 8.1**).
- The lack of Aboriginal stakeholder engagement during Plan development and implementation means that Aboriginal water values are poorly understood and protected in the Plan areas. There is a significant need to focus on opportunities to develop and resource proactive involvement of Aboriginal peoples in coastal water planning and management (**Section 8.2**).
- There was no evidence of Aboriginal specific purpose licences being applied for or issued under the Plans. The complexity and limitations on these licences inhibit any meaningful uses by Aboriginal peoples (**Section 8.3**).

In addition, the Commission continues to identify common issues in provisions relating to Aboriginal water values, rights and uses as part of its water sharing plan reviews in the 2019-20 period – these are critical to improving statewide water sharing and are included at the start of each sub-section.[244]

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241 Part 1, Division 1, Part 5(3); Division 3, Part 9(1) of the Act: '*Water sharing must first protect the water source and its dependent ecosystems, then protect basic landholder rights (including Native Title Rights)*'. There are also relevant principles under Part 1, Division 1, Section 5 of the Act that: '*(e) geographical and other features of Aboriginal significance should be protected, and (f) geographical and other features of major cultural, heritage or spiritual significance should be protected, and (g) the social and economic benefits to the community should be maximised*'. The relevant objects under Section 3 of the Act include: '*(c) to recognise and foster the significant social and economic benefits to the State that result from the sustainable and efficient use of water, including – (iii) benefits to culture and heritage, and (iv) benefits to the Aboriginal people in relation to their spiritual, social, customary and economic use of land and water; (e) to provide for the orderly, efficient and equitable sharing of water from water sources; (h) to encourage best practice in the management and use of water*'.

242 Part 2, Clause 10 of the Act.

243 Indigenous Land Use Agreements also offer a potential way of leveraging native title rights. While they present a means of supporting native title rights to water, research suggests that assessing their effectiveness is difficult as they are generally reached in-confidence. See: Hartwig, L., Jackson, S. and Osborne, N. (2018) 'Recognition of Barkandji Water Rights in Australian Settler-Colonial Water Regimes'. *Resources*, 7: pp. 16-32; O'Bryan, K. (2016) 'More Aqua Nullius: The Traditional Owner Settlement Act 2010 (Vic) and the neglect of Indigenous rights to manage inland water resources'. *Melbourne University Law Review*, 40: pp. 547-93.

244 The Productivity Commission's 2017 inquiry into national water reforms found that all jurisdictions need to undertake further work to address the needs of Indigenous Australians. Although some states and territories had progressed consultation with Indigenous communities, including in NSW, this did not extend to

The Commission notes that DPIE-Water have been progressing work on an NSW Aboriginal Water Framework with key Aboriginal stakeholders. This work includes the following:

- Ongoing development of an Aboriginal Water Strategy in partnership with the NSW Aboriginal Water Coalition.[245] The Coalition has advised the Minister for Water, Property and Housing that they would like to enter into a formal partnership with the Minister that sets out principles for co-design and commitments on Aboriginal water policy reform. The Coalition is drafting the agreement in consultation with DPIE-Water. The scope of the Aboriginal Water Strategy will be refined in partnership with the Aboriginal Water Coalition.
- Aboriginal stakeholder engagement as part of regional water strategies, including identifying challenges and aspirations around water, including options around delivering on Aboriginal water rights, interests and access to water.[246]
- Options to progress Aboriginal water outcomes are being considered across the DPIE-Water program of work, such as Aboriginal Country watering plans, regional Aboriginal governance, and translating values into actions.[247] Aboriginal stakeholder engagement is also underway on the sustainable diversion limit allocation mechanism project comprising seven Aboriginal advisory bodies, a Senior Aboriginal Program Officer and project officer.
- Further funding for project officers in the Murray Lower Darling Rivers Indigenous Nations and Northern Basin Aboriginal Nations to support regional water strategies, engagement, literacy and capability-building, and additional funding for the CEOs of these bodies to undertake strategic reviews. Specific allocations have also been used to fund the Barkandji Native Title group's *Water on Country* project.

The Commission encourages DPIE-Water to continue to drive and resource this important part of its water management portfolio – to establish a NSW Aboriginal Water Framework that provides consistent and transparent guidelines and resourcing for Aboriginal water planning and management across the state. The framework must be co-designed with key Aboriginal stakeholders and set out a range of state-wide actions to ensure Aboriginal water values are planned for and managed respectfully and consistently (for example, changes to legislation and policy, review of water licensing arrangements, landscape-scale processes for identifying, assessing, monitoring Aboriginal values and outcomes, capability-building measures, ownership, management and leadership roles). Further, DPIE-Water should ensure progress on these initiatives is transparently reported to the public at regular intervals as part of the MER program.

integrating cultural values and outcomes meaningfully in water plans. Reform of legal, administrative and governance arrangements for water was identified as a priority. In the most recent Issues Paper (2020), the Commission goes further to recommend improving support for economic development of Indigenous communities (see: www.pc.gov.au/inquiries/current/water-reform-2020/issues/water-2020-issues.pdf).

245 The Coalition includes representatives from peak agencies: Murray Lower Darling Rivers Indigenous Nations, Northern Basin Aboriginal Nations, Native Title Service Corporation, NSW Aboriginal Land Council, and Aboriginal Affairs NSW.

246 For example, see options in the Macquarie Regional Water Strategy (NSW Government (2020) *Draft Regional Water Strategy: Macquarie-Castlereagh long list of options*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0018/313281/draft-rws-macquarie-castlereagh-options.pdf).

247 For example, see options in the Macquarie Regional Water Strategy (NSW Government (2020) *Draft Regional Water Strategy: Macquarie-Castlereagh long list of options*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0018/313281/draft-rws-macquarie-castlereagh-options.pdf).

8.1 Native title provisions are not consistent or supportive

Across all water sharing plan reviews in 2019/20, the Commission has found that common native title provisions have not protected native title rights in a consistent and timely manner when determinations are made. The provisions have also not considered future native title consistently and proactively, including active native title claims, Indigenous Land Use Agreements or other agreements.[248]

The Commission recommends that DPIE-Water include a common state-wide provision to undertake preliminary amendments to a plan within six months of a native title determination or other land/water use agreement where water allocation is included in the determination. DPIE-Water should allow for additional time to undertake detailed engagement with Traditional Owners, make any specific water allocations and final amendments to the plan. Native title claims, Indigenous Land Use Agreements or other agreements should be considered proactively wherever possible as part of the planning, engagement and implementation of plans.

In this review, both Plans include an objective to protect basic landholder rights (which includes native title rights), and a performance indicator to monitor the extent to which native title requirements have been met.[249] The Richmond Plan also includes a provision to support amendments where native title rights may change under the *Native Title Act 1993*.[250]

The Plans include six Native Title determinations, eight active Native Title claims and Indigenous Land Use Agreements ('Arakwal, Byron Bay and Ti Tree Lake Indigenous Land Use Agreements' between the Bundjalung people and the NSW Government[251]) (see **Table 6** and **Figure 4** for locations). The history of Native Title and achievements of Traditional Owners and other land managers in this area of NSW is unique and offers significant learning opportunities for more effective approaches to Aboriginal water rights in NSW (see **Box 2**).

248 There are other agreements including Aboriginal Land Agreements which can 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.

249 Part 2, Clause 10(c) and Clause 12(h).

250 Part 13, Clause 93(8).

251 Agreements signed 28 August 2001 (Arakwal Indigenous Land Use Agreement 1) and December 2006 (Byron Bay Indigenous Land Use Agreement 2 and Ti Tree Lake (Indigenous Land Use Agreement 3) (see: https://www.environment.nsw.gov.au/research-and-publications/publications-search/arakwal-byron-bay-and-ti-tree-lake-indigenous-land-use-agreements).

Table 6: Native title claims and determinations in the Plan areas[252]

Richmond Plan area	
Name of native title claim	**No. active claims**
Bandjalang People #3	9
Bandjalang People #4	2
Byron Bay Bundjalung People	4
Danggan Balun (Five Rivers) People	2
Western Bundjalung People	4
Widjabul Wia-bal People	12
Name of native title determination	**No. of areas**
Bandjalang People #1	6
Bandjalang People #2	20
Bundjalung People of Byron Bay #3	3
The Githabul People	9
Western Bundjalung People Part A	8
Tweed Plan area	
Name of native title claim	**No. of active claims**
Danggan Balun (Five Rivers) People	8
Widjabul Wia-bal People	5
Name of native title determination	**No. of areas**
The Githabul People	4

These vast areas of recognised Native Title are not well supported by the Plans. The Tweed Plan specifies *'there are no native title rights in these water sources'* and does not include the common provision for allowing amendments following determinations.[253]

The Richmond Plan relies on provisions under the *Native Title Act 1993*, rather than specifying any water requirements of Native Title groups: *'The requirement for water for native title rights is the water native title holders are entitled to take pursuant to their native title rights under section 55 of the Act'*.[254] Native Title rights to water are considered generally as part of protecting basic landholder rights.[255] The background document notes that basic landholder rights are protected in line with the Act *'by using an estimate of the water requirements for basic landholder rights at the start of the Plan'*.[256] However, there are no extraction estimates used in the Richmond Plan to protect native title rights.

Relying on basic landholder rights or the *Native Title Act 1993* to provide for Native Title rights to water in NSW water sharing plans is inherently problematic. Firstly, basic landholder rights notionally mean that native title water requirements must be met first with domestic and stock

252 National Native Title Tribunal (n.d.) *About registers & applications, determinations and decisions*. Available at: http://www.nntt.gov.au/searchRegApps/Pages/default.aspx.
253 Division 2, Clause 21 of the Tweed Plan.
254 Division 2, Clause 21 of the Richmond Plan.
255 System Operation Rules (Part 6) and the Long-term average annual extraction limit (Part 7).
256 DPI-Water (2016) *Water Sharing Plan for the Richmond River Unregulated, Regulated and Alluvial Water Sources – Background document 2016*. Available at: www.industry.nsw.gov.au/data/assets/pdf_file/0007/166876/richmond-river-unreg-reg-alluvial-background.pdf.

rights, prior to any other consumptive water uses.[257] However, for this to be effective, DPIE-Water acknowledges that basic landholder rights need to be identified and accommodated within water sharing plans so that water needs can be protected from other consumptive uses.[258] Native Title rights in this case have not been identified or accommodated.

Secondly, although the *Native Title Act 1993* makes specific provisions in relation to native title rights to water,[259] the law of native title has not, to date, recognised exclusive rights in relation to water for native title parties. This is evident in the case of Bundjalung Native Title (see **Box 2**). The rights most recognised are non-exclusive (in that native title holders cannot stop other people from exercising their rights and interests over the same water) and comprise traditional uses only. The *Native Title Act 1993* states that no water entitlement is needed to satisfy water-dependent native title rights.[260]

Amendments should be made to the Plans to acknowledge all current native title, native title claimants and Indigenous Land Use Agreement holders comprehensively and reflect this consistently across both Plans. The Plans also need to reflect state-wide recommendations to strengthen native title provisions and proactive planning for native title rights and other agreements, including engagement with Traditional Owners on water requirements and entitlements.

257 Duff, N. (2017) Fluid Mechanics: The Practical Use of Native Title for Freshwater Outcomes. *AIATSIS Research Publications*, Canberra; Tan, P.L.; and Jackson, S. (2013) Impossible dreaming—Does Australia's water law and policy fulfil Indigenous aspirations? *Environment and Planning Law Journal*, 30: 132–49.

258 DPI Water (2016) *Water Sharing Plan for the Richmond River Unregulated, Regulated and Alluvial Water Sources – Background document 2016*. Available at: www.industry.nsw.gov.au/data/assets/pdf_file/0007/166876/richmond-river-unreg-reg-alluvial-background.pdf.

259 Relevant provisions in the *Native Title Act 1993* include:
- confirming Crown or government rights to the use, control and regulation or management of water
- validating any water management legislation that was enacted between 31 October 1975 and 1 July 1993 (the period between the introduction of the *Racial Discrimination Act 1975* and the *Native Title Act 1993*)
- confirming 'existing' public access to and enjoyment of waterways, beds and banks or foreshores of waterways, coastal waters and beaches where native title exists
- preserving certain native title non-commercial activities in relation to water from some types of government regulation in Section 211 (meaning no licences are required); and
- providing a future act regime to regulate how government and third parties can affect or impact native title rights to water including procedural and compensation rights in Section 24HA.

260 The Act also states that no water entitlement is needed to satisfy water-dependent native title rights. However, Clause 53 of the National Water Initiative 2004 states that: 'Water planning processes will take account of the possible existence of native title rights to water…Plans may need to allocate water to native title holders following recognition of native title rights'.

Box 2 - Bundjalung native title[261]

The Arakwal elders Lorna Kelly, Linda Vidler and Yvonne Graham made the first native title application on behalf of the Arakwal people in 1994, not long after the historic Mabo High Court decision in 1992. It became Australia's longest-running native title claim, following a 17-year application process. It is the third successful native title in NSW, comprising about 2,750 square kilometres from Evans Head, north-west to Casino, inland to Busby Flats and south to Junction Hill, and includes sacred sites such as the Goanna Headland.

The determination recognises some rights to water for Traditional Owners as below:

- to take and use the water for personal, domestic, communal purposes (including cultural purposes) but not extending to a right to control the use and flow of the water in any rivers or lakes; and
- to hunt, fish, camp, gather and use traditional natural resources (other than water) and practice natural laws and customs on the land.

The determination does not affect existing property rights but means that government bodies which manage land and water may need to negotiate with native title holders in the future.

During the native title process, several Indigenous Land Use Agreements were established to proactively consider native title rights to land, beaches and waters in the area. The Arakwal, a range of community groups, Byron Shire Council and the National Parks and Wildlife Service work together to manage these lands. Government and native title Claimants throughout Australia have used the Arakwal negotiations as a best practice model in their own respective negotiations.

8.2 Aboriginal values are not protected by the Plans

The Commission consistently finds that Aboriginal values are generally noted in the vision statements, objectives and performance indicators of water sharing plans – but they are not identified in detail as part of water planning and engagement processes, and are often limited to definitions of 'cultural use'. As a result, Aboriginal water values are not well understood or integrated in water planning and management, nor are they adequately protected.

DPIE-Water should identify Aboriginal water values and uses, objectives and outcomes in all Plan areas using cultural landscape-scale principles, through extensive engagement with local Aboriginal stakeholders. This may include flow allocations where required.

As is common with water sharing plans, the Plans do not identify Aboriginal values beyond general objectives[262] and performance indicators.[263] The Richmond Plan also includes a common clause that provisions may be amended after year five of the Plan '*to provide rules for the protection of water dependent Aboriginal cultural assets*' and that any amendments to this clause would need to take into account '*the socio-economic impacts of the proposed change*'.[264] The Richmond Plan states that groundwater dependent culturally significant sites are under

261 The three Indigenous Land Use Agreements include: Arakwal Indigenous Land Use Agreements 1 (2001 between the Bundjalung of Byron Bay Arakwal people and the NSW Government), Arakwal Indigenous Land Use Agreements 2 (2006, to cover nature reserves in Byron Bay and additions to Arakwal National Park), and the Ti Tree Lake Aboriginal Area (Indigenous Land Use Agreements 3). See: Burin, M. (2013) 'Emotions high as Bandjalang people granted long-awaited Native Title'. *ABC News*, 2 December. Available at: www.abc.net.au/local/photos/2013/12/02/3903473.htm; DPIE (2019) *Indigenous Land Use Agreements*. Available at: www.environment.nsw.gov.au/research-and-publications/publications-search/arakwal-byron-bay-and-ti-tree-lake-indigenous-land-use-agreements.

262 Part 2, Clause 10(b) of the Plans.

263 Part 2, Clause 12(j) of the Plans.

264 Part 13, Clause 93(9) and (10) of the Plans.

investigation by the Aboriginal Water Initiative System (disbanded in 2017)[265] and may be identified during the term of this Plan. However, there is no evidence this work was undertaken.[266]

The lack of identification and consideration of Aboriginal values in the Plans was confirmed in stakeholder engagement, as described below:

> *'We are not aware of any way that the Plan has achieved this stated objective [to protect, preserve, maintain and enhance the Aboriginal, cultural and heritage values of these water sources]. Nor are we aware that there has been any study to identify Aboriginal, cultural or heritage items or sites related to water systems in the plan area*'.[267]

In the Tweed Plan area, a number of stakeholders recognised that large parts of the Doon Doon area have significant Aboriginal values that have been mapped (by local government and others in collaboration with Aboriginal peoples). These should be accounted for in water planning decisions (such as the prohibition of a dam within Byrill Creek water source and also the potential raising of Clarrie Hall Dam, see **Section 4.2**):[268]

> *'There are fairly large areas of the Doon Doon valley identified in Tweed Shire Council's mapping of known and predictive areas of Aboriginal culture and heritage, which should be respected and taken into account regarding water usage. Unfortunately, the building of Clarrie Hall Dam submerged some sites of significance for the Aboriginal inhabitants of the Tweed. From discussing the matter of the additional raising of the dam wall with a Senior Aboriginal person I understand that further sites of significance will be submerged when the water level rises*'.[269]

Both Plans should reflect the Commission's state-wide recommendations to strengthen the processes for identifying and protecting Aboriginal water values, material and intangible, as part of a broad cultural landscape approach.[270] There have been significant efforts to provide guidance on how to undertake effective engagement with Aboriginal stakeholders to identify

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265 The Aboriginal Water Initiative was disbanded in 2017. Until recently, there has been little resourcing for this work and a reliance instead on Aboriginal Elders with limited experience in water management. The background document also notes the role of the Aboriginal Water Trust, which was established under the Act and operated until 2009. It offered financial assistance to Aboriginal groups in purchasing fully commercial water licences, provided specific purpose grant funding for water infrastructure (for example, irrigation, pumps), and opportunities to establish water-based commercial enterprises (see: www.water.nsw.gov.au/__data/assets/pdf_file/0004/547303/plans_aboriginal_communities_water_sharing_our_water_our_country.pdf).

266 Division 2, Clause 71 of the Richmond Plan.

267 Tweed Landcare, received 1 July 2020; Byrrill Creek Landcare, received 26 June 2020; Caldera Environment Centre, received 29 June 2020; Individuals, received 2 July 2020, 28 June 2020, 30 June 2020, 2 July 2020; Tweed Shires Water Strategies Project Review Group, received 2 July 2020.

268 '*There are 26 Aboriginal Cultural Heritage sites, and also a wildlife & climate change corridor linking the Mt Warning & Mebbin National Parks that runs through Byrrill Creek Valley*'. Submission: Byrrill Creek Landcare, received 26 June 2020.

269 Submission: Individual, received 16 June 2020.

270 The document *Dhungala Baaka* provides a summary of the diversity of Aboriginal water-related values including: 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 economic development and opportunities. 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.mldrin.org.au/wp-content/uploads/2018/06/Dhungala-Baaka.pdf.

water values[271], including Aboriginal waterways assessments[272] and cultural flows assessments – these have been detailed in the Commission's previous water sharing plan reviews.[273] There is also a significant body of work undertaken by local councils and others in collaboration with Aboriginal Peoples, such as that contained in Tweed Shire Council's *Aboriginal Cultural Heritage Management Plan 2018*, which is supported by a thematic history and shire-wide mapping of Aboriginal places of heritage significance and predictive Aboriginal cultural heritage mapping.[274]

The review also highlighted limited awareness and engagement of local Aboriginal stakeholders in water planning. The background documents for the Plans note one meeting was held with unspecified 'Aboriginal representatives' and Aboriginal Community Support Officers of the then Catchment Management Authority in Lismore in April 2006.[275] The lack of engagement during Plan development and implementation means that Aboriginal water values are poorly understood in the Plan areas. As is common across water sharing plans, this lack of detailed understanding of Aboriginal values means plans are often 'trading off' a very narrow definition of traditional cultural water values against other social and economic interests.[276]

There is a significant need to focus on opportunities to develop and resource proactive involvement of Aboriginal peoples in water planning and management across NSW, to better support Aboriginal water values. Indigenous governance models are critical to this process.[277]

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

272 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).

273 See for example: Natural Resources Commission (2020) *Final report: Review of the Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources 2009*. Available at: https://www.nrc.nsw.gov.au/2019-2020-wsp-reviews); Natural Resources Commission (2019) *Final report: Review of the Water Sharing Plan for the Barwon-Darling Unregulated and Alluvial Water Sources 2012*. Available at: https://www.nrc.nsw.gov.au/2018-2019-wsp-reviews.

274 Tweed Shire Council (2019) *Aboriginal Cultural Heritage.* Available at: https://www.tweed.nsw.gov.au/AboriginalCulturalHeritage.

275 NSW Office of Water (2010) *Water Sharing Plan, Tweed River Area Unregulated and Alluvial Water Sources Background document*, p. 24. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0004/549418/wsp_tweed_river_background.pdf; *DPI-Water (2016) Water Sharing Plan for the Richmond River Unregulated, Regulated and Alluvial Water Sources – Background document for amended plan 2016,* p. 40. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166876/richmond-river-unreg-reg-alluvial-background.pdf.

276 In the current NSW water allocation framework, cultural values are treated as sites or places where 'cultural activities' take place, allocations can then be used to 'water' those sites, in the same way that water is delivered to irrigators. Environmental, irrigation, social or cultural values are subsequently traded off which contradicts Aboriginal understanding in which each value is inherently connected (Davies, S., Wilson, J. and Ridges, M. (2020) 'Redefining 'cultural values' – the economics of cultural flows'. *Journal of Water Resources*, DOI: 10.1080/13241583.2020.1795339).

277 Indigenous governance can be described as the unique ways in which Indigenous people come together to make decisions and engage in cultural, economic and social activities. It is made up of a system of cultural geographies (Country), culture-based laws, traditions, rules, values, processes and structures that has been effective for tens of thousands of years, and which nations, clans and families continue to adapt and use to collectively organise themselves to achieve the things that are important to them. Reconciliation Australia

Such a governance model was devised for the Richmond Catchment – the 'Richmond River First Australian's Partnership' – as part of a report commissioned by DPIE-Water and local governments in the area.[278] It was recommended that elements of this model be included in any governance adopted for the water catchment – to ensure meaningful engagement between government, local landholders, Traditional Owner groups and Aboriginal peoples.

A governance model for the Richmond Catchment should be further developed in consultation with local Aboriginal stakeholders and integrated as part of water planning and management across Plan areas. Both Plans need to reflect the Commission's state-wide recommendations to strengthen the processes for identifying and protecting Aboriginal water values, through culturally sensitive engagement and genuine involvement of Aboriginal peoples in decision-making.

8.3 Licence provisions are limiting Aboriginal outcomes

The Commission's water sharing plan reviews continually demonstrate that Aboriginal-specific water licences available in NSW are highly restrictive, subject to significant limitations in use and awareness, and unable to be easily accessed and applied for.

DPIE-Water should co-design licences or other water custodianship and access options with Aboriginal stakeholders that meet identified needs (for a range of cultural, environmental, social and economic uses).

The Plans include specific purpose access licences for Aboriginal uses: 'Aboriginal cultural' and 'Aboriginal community development' licences. The specific purpose access licence for 'Aboriginal cultural' uses are considered in inland and coastal surface water and groundwater systems and will generally be granted, as long as the water is not used for commercial activities,[279] and are capped at up to 10 ML per licence per year.[280]

'Aboriginal community development' access licences can be used for commercial activities in some coastal catchments with higher, more reliable flows.[281] However, in contrast to other licences in this Plan, the Aboriginal community development licences are only in very limited management zones and can only be provided for B Class flows. For example, in the Richmond Plan it is not clear why only four water sources qualify for Aboriginal Community

(2019) *Understanding Indigenous Governance*. Available at: https://indigenousgovernance.org.au/wp-content/uploads/2020/04/IGP-Factsheet-1-Understanding-Governance.pdf).

278 Alluvium (2019) *Richmond River Governance and Funding Framework*. Report prepared for DPIE and supporting local governments. Available at: https://richmondvalley.nsw.gov.au/wp-content/uploads/2020/02/Richmond-River-Governance-and-Funding-Framework-Final-Report.pdf).

279 Specific purpose category licences provide higher priority access to water than licences for most commercial purposes. These licences do not have a tradable value for purchase or sale, and the share component is expressed in megalitres per year. As with all water access licences, the Aboriginal cultural access licence includes certain conditions need to be met in order to be eligible to apply for this type of licence. Water must be used only for any personal, domestic or communal purpose, including drinking, food preparation, washing, manufacturing traditional artefacts, watering domestic gardens, cultural teaching, hunting, fishing, gathering and for recreational, cultural and ceremonial purposes. See Part 8, Clause 52(7) of the Plans.

280 See Part 8, clauses 38(4) and 50(5) of the Plans.

281 In some coastal rivers, higher and more reliable flows provide an opportunity for the granting of Aboriginal community development access licences, provided this additional extraction would not negatively impact on ecological values that are dependent on these high flows. These licences allow water to be pumped from rivers during the higher flows, and stored in farm dams or tanks, to be used as needed. The total volume of water that can be extracted for Aboriginal commercial purposes from a water source is limited to a proportion of the river flow not to each individual Aboriginal community development licence.

Development licences, whereas nine water sources include provisions for high flows. Moreover, the limitations to B Class flows inhibits any meaningful commercial use. Firstly, the licences are for relatively small volumes of water, which means that many commercial operations would be unviable. Secondly, accessing B Class flows requires large upfront costs with significant on-farm infrastructure to pump and store water, which many Aboriginal stakeholders do not have access to in these areas.

This review has not identified any instances where these licences have been applied for or issued under the Plans. As noted in other water sharing plan reviews, uptake of Aboriginal specific purpose access licences is negligible across NSW. There are a range of reasons for this including that:

- DPIE-Water does not have a clear process for accessing and applying for these licences
- Aboriginal stakeholders have limited awareness of their existence and use
- there is confusion around the purpose of the licences
- they are limited in terms of flow classes and commercial uses, meaning that meaningful water uses are restricted.

Research continues to show that Aboriginal water holdings are suffering disproportionately under NSW licencing rules, creating issues of inequity and further dispossession that need to be addressed at a state-wide scale,[282] and in line with new Closing the Gap targets.[283] The Plans need to revise Aboriginal water access licences through a co-design process with Aboriginal stakeholders. This process needs to consider a range of volumetric, non-volumetric and non-licensed solutions, and trading flexibility under flow scenarios to better support Aboriginal water access, rights and use.

DPIE-Water should also consider whether unallocated water could be reserved for the co-designed licences or other water custodianship options for Aboriginal peoples before being offered to the market on commercial terms.

282 Using empirical water entitlement data, a recent study profiled the composition, spatial distribution and value of Aboriginal water holdings in the NSW portion of the Murray-Darling Basin. It showed that while Aboriginal people in this area constitute nearly 10 percent of the population, their organisations hold only 0.2 percent of the available surface water. In addition, 17.2 percent of Aboriginal water holdings by volume were lost between 2009 and 18. A range of factors rendered Aboriginal water-holders vulnerable to loss of valuable water rights and the benefits of water access, including water market participation (Hartwig, L., Jackson, S. and Osborne, N. (2020) 'Trends in Aboriginal water ownership in New South Wales, Australia: The continuities between colonial and neoliberal forms of dispossession', *Land Use Policy*, 99.

283 The new National Agreement on Closing the Gap includes an additional outcome area '*Aboriginal and Torres Strait Islander people maintain a distinctive cultural, spiritual, physical and economic relationship with their land and waters*' and two associated targets for land and water: '*a) Target 15a: By 2030, a 15 per cent increase in Australia's landmass subject to Aboriginal and Torres Strait Islander people's legal rights or interests; b) Target 15b: By 2030, a 15 per cent increase in areas covered by Aboriginal and Torres Strait Islander people's legal rights or interests in the sea*' (Closing the Gap (2020) *National Agreement on Closing the Gap*. Available at: www.closingthegap.gov.au/sites/default/files/files/national-agreement-ctg.pdf).

8.4 Recommendations

R 15 – Both Plans	Amend the Richmond and Tweed Plans to reflect all current native title determinations and claimants and Indigenous Land Use Agreement holders comprehensively and reflect this consistently across both Plans.
R 16	Reserve unallocated water for Aboriginal specific licences or other Aboriginal water access options, before being offered to the market on commercial terms.
R 17* - Both Plans	Finalise a NSW Aboriginal Water Strategy in 2021 to provide consistent, transparent guidelines and resourcing for Aboriginal water management across NSW, comprising the following at a minimum: a) **Improve recognition of native title** by including a common provision to undertake preliminary amendments to a plan within six months of a native title determination or other agreement that includes water allocation. b) **Allow additional time to undertake detailed engagement** with Traditional Owners, make water allocations and final plan amendments; considering native title claims proactively as part of water sharing planning. c) **Identify Aboriginal water values and uses, objectives and outcomes** by undertaking extensive engagement with Aboriginal stakeholders in all plan areas; prioritising allocations to protect values; adopting cultural landscape-scale principles; integrating identified values into ongoing water planning and management. d) **Co-design Aboriginal specific licences or other water access options** with key Aboriginal stakeholders that meet identified needs for a range of cultural, environmental, social and economic uses.

9 Opportunities to improve MER

The NSW Government recognised the need for robust MER frameworks when water sharing plans were developed,[284] consistent with requirements of the Act and the National Water Initiative.[285] An MER framework is required to collect information to understand if plans are contributing to outcomes, informing timely decision making, improving plans and providing transparency.

However, only limited MER activities have been undertaken to date for the Plans. 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.[286]

The Commission recognises the positive steps taken by DPIE-Water to address gaps in MER for coastal water sharing plans. DPIE-Water advised that it has recently developed a coastal MER scoping paper that identified the environmental MER needs of coastal plans and set out a roadmap for establishing an effective program to assess the ecological response to Plan provisions. This paper was superseded after DPIE-Water was successful in securing Treasury funding to support a new implementation unit, including delivery of priority water resource management, implementation and reporting activities in 2020/21. These strategic monitoring and implementation projects will be progressed to assist in the implementation of a fit-for-purpose MER program for both coastal and inland catchments.

In addition, DPIE-Water has also undertaken:

- initial irrigator surveys to monitor social and economic changes in water sharing plan areas, although these have now ceased[287]
- *Guidelines for setting and evaluating plan objectives for water management* (2018)[288]
- 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.[289]

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284 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.

285 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.

286 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.

287 Department of Trade and Investment (2015) *Monitoring economic and social changes in NSW water sharing plan areas*. Available at: www.water.nsw.gov.au/__data/assets/pdf_file/0010/548362/irrigators_survey_report_2013.pdf.

288 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 (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).

289 Advice received from DPIE-Water, February 2019.

The Commission also recognises that there are currently limited resources for MER activities and that DPIE-Water is undertaking projects to support efficient and effective use of available resources, including water source prioritisation and transferability studies. Given limited resources, it will be critical for DPIE-Water to continue to identify efficiencies, focus on the most critical MER and continue to work collaboratively with other government agencies to coordinate monitoring activities that support the evaluation of the Plan. MER and reporting systems that are publicly available should be prioritised to demonstrate accountability for this requirement under the Act.

Previous Commission reviews have discussed the limitations of water sharing plan MER in detail.[290] These limitations make it difficult to understand the extent to which outcomes are being achieved and effectively review plans. They include:

- **No plan-specific MER framework –** The background documents for the Plans indicates that DPIE-Water developed an MER framework for water sharing plans, which included performance indicator assessment (using the Environmental Flows Monitoring and Modelling Program), as well as Section 44 implementation audits at Year 5 and the Commission's 10-year review. Apart from these activities, there does not appear to be further Plan-specific MER against the performance indicators or objectives including on environmental water or the environmental condition of the water sources in the Plan area. Without this, key plan-specific risks are not being adequately monitored and addressed. For example, DPI-Fisheries advised that there has not been any recent monitoring of eastern freshwater cod and that surveys are needed to determine population status, including any recruitment.
- **No clearly defined outcome, objectives, strategies and performance indicators –** Environmental, social, economic and Aboriginal outcomes are not clearly specified or prioritised in line with the Act. Objectives do not clearly link with the outcomes, strategies and indicators (see **Appendix A**). Performance indicators are high-level and impractical to evaluate against – they are not designed to be specific, measurable, achievable, relevant and time-bound (SMART). There are also significant gaps in these elements, such as the identification of outcomes and indicators for Aboriginal values specific to the Plan areas.
- **Significant gaps in knowledge base –** The Commission's review revealed a range of key knowledge gaps for both Plans as outlined in previous chapters, including:
  - groundwater source variability and connectivity, environmental flow studies, tidal pool dynamics and values
  - stochastic modelling for climate change (this will be available through regional planning processes)
  - Aboriginal water values and uses
  - socioeconomic impacts and economic dependencies.

  Stakeholder feedback also emphasised the need for studies on connectivity (see **Section 7.1**), modelling and better consideration of climate change:

  'There is a lack of scientific data of both above ground & groundwater sources in the Tweed which means the current Water Sharing Plan, is ineffective in making any future decisions on water

290 For example, see reports at Natural Resources Commission (2020) *Water sharing plan reviews*. Available at: https://www.nrc.nsw.gov.au/wsp-reviews.

licensing. This needs to be remedied (& funded) as soon as possible, and Climate change particularly needs to be taken into account'.[291]

- **Unclear roles and responsibilities –** There is no overarching program, or clearly documented procedures or responsibilities to guide MER activities over the life of the Plans, to ensure enough data is collected to report on performance. MER is undertaken by many agencies (including DPIE-Water, DPIE-EES, WaterNSW, DPI-Fisheries, NRAR and councils) and a coordinated approach is needed to drive efficiency and knowledge sharing.
- **Limited adaptive management –** The Plans include provisions for adaptive management, which were intended to allow the Plans 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. DPIE-Water should consider establishing systems that trigger consideration of adaptive management issues (such as studies) over the life of the Plans to meet obligations under this objective. To improve transparency, these should be tracked and made publicly available. The Commission is not aware of any instances where studies referred to in the Plans were carried out or reported. As such, planned amendments resulting from studies identified when the Plans commenced have not been made.
- **Metering –** Many stakeholders are concerned about the lack of metering in the North Coast and consider it a major impediment to better management, particularly as many users in the Plan areas will be exempt from the *NSW Non-Urban Water Metering Policy*.[292] The lack of transparency of extraction has created animosity between stakeholders and metering would alleviate this tension.

  The NSW Chief Scientist and Engineer highlighted the need to improve monitoring and extraction of groundwater to accurately understand the impacts of industries and water sharing plans provisions. Further, transparent reporting of monitoring would help address stakeholder concerns and strengthen trust in Plan provisions.[293] The Commission recognises that the *NSW Non-Urban Water Metering Policy* is ratified by the NSW Government and meets national standards. However, given the unique requirements of coastal catchments and future pressures in the region, DPIE-Water should consider engaging with stakeholders to implement a broader rollout of metering. In times of low flows, metering would help manage extractions and support irrigators to comply with extraction requirements.[294]

DPIE-Water also advised that it is currently developing an overarching evaluation framework and monitoring plans for water sharing plans. Previous water sharing plan reviews have

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291 Submission: Individuals, received 27 June 2020, 29 June 2020, 30 June 2020, 2 July 2020, 27 June 2020; Byrrill Creek Landcare, received 26 June 2020.

292 The policy was designed to improve metering across NSW by implementing broader scale metering of extraction volumes. The roll out of non-urban metering rules is staged, with phase one (surface water pumps 500 millimetres or greater in size) taking effect on 1 December 2020. All remaining works that meet the metering thresholds in the water sources in Coastal catchments will be rolled out 1 December 2023 (DPIE-Water (2020) *Overview of the non-urban water metering framework* Available at: https://www.industry.nsw.gov.au/water/metering/overview-of-the-non-urban-water-metering-framework).

293 NSW Chief Scientist and Engineer (2019) *Independent review of the impacts of the bottled water industry on groundwater resources in the Northern Rivers region of NSW - Final Report* Available at: https://www.chiefscientist.nsw.gov.au/__data/assets/pdf_file/0019/285040/Final-Report_Northern-Rivers-Bottled-Water-Review.pdf.

294 Submission: Rouse County Council, received 3 July 2020.

recommended finalising MER programs and it is evident that DPIE Water is taking steps to achieve this and build an evidence base for informing Plan reviews and replacement. As part of this process, DPIE Water should:

- identify Plan-specific outcomes linked to clear objectives, strategies and performance indicators – this should include outcomes related to environmental, social, economic and Aboriginal objectives
- clearly define roles, responsibilities and timing for MER activities and adaptive management
- 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
- ensure their MER is integrated with other existing MER programs where relevant and appropriate.

9.1 Recommendations

R 18* - Both Plans	By 1 July 2023, to improve transparency and support the achievement of outcomes in line with the water management principles and priorities of the Act, DPIE-Water should strengthen MER, including: a) completing studies required to improve the knowledge base and for adaptive management b) developing Plan-specific publicly available MER frameworks consistent with the coastal and state-wide guidelines. The framework should include linked and SMART objectives, strategies and performance indicators, define roles and responsibilities, set timely public reporting requirements and include adaptive management processes.
SA G* – Both Plans	Continue to develop state-wide evaluation framework and monitoring plan, considering and addressing key gaps and prioritising MER activities based on values and risk. The framework, monitoring plans and reporting should be publicly available to improve transparency.
SA H* – Both Plans	As part of the Plan replacement in 2023, 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.

10 Opportunities to improve Plan development and implementation

As part of this review, the Commission has identified several opportunities to improve the development and implementation of the Plans. The Commission recognises that implementation is assessed under the Section 44 implementation audits.[295] However, the opportunities identified warrant noting as they are necessary to support the effective remake of the Plans, and achieve the Act's objects, apply the Act's principles, and achieve the objectives of the Plans. Many of these issues are consistent across water sharing plans and could be addressed using a state-wide approach. Suggestions include:

- strengthen communication and education (**Section 10.1**)
- implement clear, consistent and appropriate governance (**Section 10.2**)
- develop community relationships and capacity (**Section 10.3**)
- adopt an integrated catchment management approach (**Section 10.4**).

10.1 Strengthen communication and education

There is a general lack of stakeholder understanding of the Plans and the extent to which provisions and planned actions have been implemented. This creates opportunities for community mistrust, tension and non-compliance. Stakeholders conveyed the need for improving government support programs.

While recognising that the Plans are legal documents, the replacement Plans need to be accessible and easily understood. The Plans should use simple and concise language and structure, including for objectives and outcomes, to improve clarity and transparency. Many stakeholders felt that language could be simplified to improve understanding and compliance with provisions. Guidance documents, fact sheets and similar supporting materials could also be used to effectively communicate elements of the Plans.

Aspects identified by stakeholders that could be better communicated included water licence conditions (*'When restrictions are enacted town residents do not understand farmers licence conditions'*[296]). In lieu of clear communication and guidance, many water users are making assumptions around provisions or providing their own interpretation and advice through water groups.

It may also be useful to improve broader understanding of water sharing principles. Information should also be readily available to the public:

> '*Information with respect to water allocations within water sources, water licenses within catchments and associated data is hard to find and difficult to interrogate to gain a full picture of*

295 Alluvium and Vista Advisory (2019) *Audit of the Water Sharing Plan for the Richmond River Area Unregulated, Regulated and Alluvial Water Sources*. Report prepared for DPIE. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0008/289502/Richmond-River-Area-Unregulated,-Regulated-and-Alluvial-Water-Sources-2010.pdf; Alluvium and Vista Advisory (2019) *Audit of the Water Sharing Plan for the Tweed River Area Unregulated, Regulated and Alluvial Water Sources*. Report prepared for DPIE. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0011/289505/Tweed-River-Area-Unregulated-and-Alluvial-Water-Sources-2010.pdf.

296 Submission: Individual, received 12 July 2020.

> *what should be happening within a catchment. It is assumed that government departments have access to a consolidated picture of data and information, and if so, this information should also be publicly available and easily accessible'*.[297]

The Commission also recommends detailed education programs on more complex issues and targeted education for specific stakeholder groups – during development and over the life of the Plans. Stakeholders consider education is essential to reduce uncertainty and change water use behaviours:

> '*Government should undertake community education around water sharing, to help the average licence holder to understand their obligations. This would result in better compliance, and also provide the opportunity for 2 way learning, where both government staff and farmers benefit and contribute'*.[298]

This education should be sufficiently detailed where the objective is to reaffirm or clarify water users' awareness of certain Plan provisions. More targeted education activities should also be adopted for specific stakeholder groups, particularly Traditional Owners and Aboriginal stakeholders. To date, these groups have been overlooked in the planning process and implementation of these Plans. This group requires targeted education on relevant water rights and interests, to be engaged on the key water values and issues and involved in meaningful co-design efforts around water sharing.

10.2 Implement clear, consistent and appropriate governance

There are several instances in which the Plans and supporting actions were not implemented.[299] The implementation of the ECA under the Richmond Plan is an example where the lack of clear responsibilities resulted in provisions not being implemented (see **Section 6.1.1**).

It is important that planned actions are supported with clear governance, particularly well-defined and feasible roles, responsibilities and timeframes for actions. These are lacking in the current provisions. Section 44 implementation 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.[300]

The NSW Chief Scientist and Engineer also reinforced the need for '*State government agencies and local government [to] work to clarify roles and responsibilities to streamline assessment and approval processes, to avoid duplication of effort, and to address any gaps in the assessment and approvals process'*.[301]

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297 Submission: Ballina Shire Council, received 9 July 2020.

298 Submission: Combined Richmond and Wilsons Water Users Association, received 30 July 2020.

299 Alluvium and Vista Advisory (2019) *Audit of the Water Sharing Plan for the Richmond River Area Unregulated, Regulated and Alluvial Water Sources*. Report prepared for DPIE. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0008/289502/Richmond-River-Area-Unregulated,-Regulated-and-Alluvial-Water-Sources-2010.pdf; Alluvium and Vista Advisory (2019) *Audit of the Water Sharing Plan for the Tweed River Area Unregulated, Regulated and Alluvial Water Sources*. Report prepared for DPIE. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0011/289505/Tweed-River-Area-Unregulated-and-Alluvial-Water-Sources-2010.pdf.

300 Alluvium and Vista Advisory (2019*) Audit of the Water Sharing Plan for the Barwon-Darling Unregulated and Alluvial Water Sources 2012*. Report prepared for DPIE. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/289474/Barwon-Darling-Unregulated-and-Alluvial-Water-Sources-2012.pdf.

301 Submission: Rouse County Council, received 3 July 2020.

In addition, stakeholders considered that governance of water is confusing. Several water users complained about the difficulty they had experienced in trying to get advice from different agencies and found they were getting 'bounced' between different agencies:

> '*[we] encountered difficulties in relation to obtaining the necessary information from government authorities and identifying the appropriate departments and/or officers responsible for dealing with its requests … 'we have witnessed a level of confusion and lack of understanding at all levels of local and state government as to the identification of the authorised decision maker and the correct process to follow...online policy information has often been out of date, misleading, incorrect or contradictory…we have been caught up in separate departments that have insisted each of the other is responsible for processing our applications, leaving us at a loss to how to proceed. Adding to the problem are substantial time delays, resulting from delayed responses from state agencies, lengthy processing time of submitted applications as a result of pursuing incorrect advice provided by these parties*'.[302]

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 **Chapter 9**). 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, NRAR 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.

10.3 Develop community relationships and capacity

Improved communication of the Plans needs to be sustained through effective stakeholder engagement. Stakeholders felt that the NSW Government should lead more active and inclusive engagement on water.[303] For instance, some felt that the Plans do not adequately reflect the coastal industry stakeholders with water interests.

The lack of stakeholder advisory panels or similar engagement mechanisms was raised across all coastal water sharing plans and was seen to contribute to poor stakeholder relationships, particularly with Aboriginal stakeholders:

> '*With no coastal stakeholder advisory panels planning policies are quite often out of line with water user problems and expectations. The department is often lagging behind in water usage changes, crop changes and community expectations*'.[304]

Stakeholders noted that water user groups and associations played a key support role in educating and notifying irrigators and were also a great source of knowledge for the department:

> '*In the past there has been involvement of the water users groups in determining that cease to pump thresholds have been reached and in letting irrigators know that restrictions or cessations to pumping should commence*'.[305]

> '*Our [Water user group] has contributed to the protection of low flows irrespective of the Plan*'.[306]

302 Submission: Leda Holdings, received 3 July 2020.
303 Submission: NSW Irrigators Council, received 25 October 2019.
304 Submission: Individual, received 3 June 2020.
305 Submission: Richmond and Wilsons Combined Water Users Association, received 12 July 2020.
306 Submission: Goolmangar Water User Group, received 12 July 2020.

The Commission understands agency support for these groups has been disbanded but some groups still meet informally. Without these groups, irrigators have to rely on key community figures who voluntarily provide guidance. These individuals cannot achieve the level of coverage that organised and agency support groups can. Without coordinated support, implementing provisions is problematic. To be effective, coastal water sharing plans must account for local context and engaging local representatives will improve the achievement of plan objectives and implementation.

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 have a high number of water sources, but the benefits of these approaches in achieving plan 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.

A primary concern raised by a broad range of Tweed stakeholders was without adequate support compliance with Plan provisions is compromised:

> *'Lack of compliance by many of water users in the Tweed is inadequate to effectively manage and put the Water Sharing Plan into operation. The self-regulating of water licenses is open to abuse and has proved not accountable within the Water Sharing Plan or regulatory bodies."*[307]

> *'At present most water Licences within the Tweed are self-regulating and although licence requirements state extraction allowances, that a meter be installed, and records be kept, many do not uphold these requirements When a compliance issue arises it is a long winded process between NSW Water and National Resources Access Regulator to actually get any compliance issues dealt with in a timely manner. The results of a compliancy complaint are not released by the Department to the person who instigated the complaint, so one doesn't know what action was taken, nor the time frame that compliance action will actually occur'.*[308]

Stakeholders perceive the challenges with compliance are caused by three factors: a lack of metering, lack of water user awareness and a lack of agency timeliness in processing complaints:

> *'I speak from a personal experience in dealing with this in November last year. I was informed there was a 6 week to 2 month waiting time to deal with an issue, due to backlog of compliance complaints. There needs to be a far better system of accountability, speed of action, and checks & balances put into place'.* [309]

> *'Compliance breaches have occurred but have generally not been dealt with in a timely or effective manner. Further inquiry is urgently needed to determine effective systems of accountability, compliance, monitoring and timeliness of outcome'.*[310]

307 Submission: Northern River Guardian Inc, received 3 July 2020; Individuals, received 28 June 2020, 29 June 2020, 30 June 2020, 2 July 2020.
308 Submission: Byrrill Creek Landcare, received 26 June 2020.
309 Submission: Tweed Water Alliance, received 3 July 2020.
310 Submission: Tweed Landcare, received 1 July 2020.

10.4 Adopt an integrated catchment management approach

While some environmental risks can be addressed through the Plans, ecological condition is also impacted by issues outside of the Plans' regulation.

DPIE-Water should consider risks and actions to improve river and estuary health outside of the Plans during development and implementation and identify areas for collaboration or additional research or activity, including with relevant agencies across Planning, Industry and Environment cluster.

This has multiple benefits. First, helps to build and sustain an effective evidence base for the Plans. The review identified several instances where the Plans need to better accommodate and align with key external policies, plans and risks. This includes alignment with other water-related plans such as the *Far North Coast Regional Water Strategy* (see **Chapter 3**), and information on broader climatic, social and economic trends and risks in the region. Second, 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 aquatic habitat via refuge restoration, removal of barriers to fish passage and reinstatement of instream woody habitats[311]
- protecting and restoring riparian zones by minimising over-clearing and poor management practices, implementing buffer zones, riparian fencing and native revegetation
- addressing water quality and coastal ecosystem impacts from bushfires – actions are being undertaken by the NSW Government as part of the Bushfire Affected Coastal Waterways Program provides $5 million to minimise the effects of the bushfires through activities such as sediment and erosion control, water quality monitoring, wetland restoration or riparian corridor management.[312]

These issues can be better accommodated in the replacement Plans by drawing on the wide range of available evidence during 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.[313] This will increase overall resilience at the landscape scale, which is particularly important as climate change places additional pressures on environmental, social and economic outcomes.

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

312 DPIE-EES (2019) *$5 million for bushfire affected coastal waterways.* Available at: https://www.environment.nsw.gov.au/news/5-million-for-bushfire-affected-coastal-waterways?utm_source=miragenews&utm_medium=miragenews&utm_campaign=news.

313 Local Land Services (2016) *State Strategic Plan 2016-2026*. Available at: https://www.lls.nsw.gov.au

10.5 Suggested actions

SA I* – Both Plans	DPIE-Water should adopt state-wide processes that support the Plan remake and implementation by: a) enhancing communication of water sharing plans through active, simple, and consistent language and modes of communication b) improving implementation using clear and consistent governance, roles and responsibilities, and timelines.
SA J* – Both Plans	As part of the Plan replacement, DPIE-Water should develop well-evidenced and resourced processes for stakeholder engagement in the Plan area. This should be part of a strengthened state-wide stakeholder engagement strategy.
SA K* – Both Plans	By 1 July 2023, DPIE-Water should adopt integrated catchment management approaches that support the Plans' replacement and implementation.

11 Compensation implications of 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*'.

Many of the recommendations can be advanced without triggering compensation. However, the Commission considers that compensation might be payable under Section 87AA in relation to **recommendations which relate to both the Richmond and Tweed Plans 4(a), 6, 10(b), and 12(b),** as outlined below:

- **Recommendation 4:** By 1 July 2023, DPIE-Water should ensure all extraction under the Plans is managed to protect, preserve and maintain the water sources, aquifer integrity and dependant ecosystems by:

  a) establishing and publishing fixed, numeric values for LTAAELs and ensuring they are based on best available information, including ecological requirements, an accurate estimate of basic landholder rights and climate change

- **Recommendation 6:** By 1 July 2023, to improve environmental flow rules in the Richmond Plan for infrastructure where environmental releases are currently not provided for or are suboptimal, DPIE-Water should:

  a) use best available information to determine suitable, outcomes-focused environmental flow regimes for all dams and weirs, and ensure these are reflected in Plan rules and licence conditions

- **Recommendation 10:** By 1 July 2023, to improve outcomes for native fish, DPIE-Water should collaborate with DPI-Fisheries to:

  b) update Plan provisions based on best available information, including fish flow requirements (including to achieve fish passage), key fish habitat mapping, new listings of threatened native fish and DPI-Fisheries' threatened species distribution mapping

- **Recommendation 12:** By 1 July 2023, to improve the management of connectivity, DPIE-Water should:

b) revise access rules accordingly to include new bore licences beyond 40 metres from the high bank of a river for areas that are identified as highly connected in 12(a) and stage access rules for existing bores

Recommendation 4(b) could result in changes to the LTAAELs based on environmental needs, which may require compensation in some circumstances if entitlements need to be reduced based on the revised extraction limit. Changes to the LTAAEL may be the result of the use of new or improved information, but may also reflect natural changes to inflow due to climate change.

Recommendation 6 may result in changes to entitlements if studies show that the amount previously allocated to the environment is inadequate. This would be subject to further investigation and would only be applicable if entitlements were reduced.

Recommendation 10(b) may result in changes to entitlements to provide additional water to the environment for fish passage because of more accurate scientific knowledge.

Recommendation 12(c) may result in existing bore licence holders cease to pump conditions beyond 40 metres being increased. This is likely to affect when they can pump from aquifers rather than leading to a reduction in entitlement. Thus, the Commission is of the view that compensation is *unlikely* to trigger compensation.

The Commission is of the view that the remainder of the recommendations can be implemented in a manner that does not require compensation.

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

Appendix A – Plan objectives, strategies and indicators

Table 7: Objectives, strategies and indicators in the Richmond Plan

Stated Plan objective	Plan strategy	Stated Plan performance indicator
The vision of this Plan is to provide for healthy and enhanced water sources and water dependent ecosystems and equitable water sharing among users in the Richmond River Area Unregulated, Regulated and Alluvial Water Sources.		
10(a) protect, preserve, maintain or enhance the important river flow dependent ecosystems of these water sources	(a) establish environmental water rules (e) establish rules that place limits on the availability of water for extraction (f) establish rules for making available water determinations (h) establish rules which specify the circumstances under which water may be extracted	12(a) change in low flow regime 12(b) change in moderate to high flow regime 12(c) change in surface water and groundwater extraction relative to the long-term average annual extraction limit 12(d) change in water quality in these water sources 12(e) change in the ecological condition of these water sources and their dependent ecosystems
10(b) protect, preserve, maintain and enhance the Aboriginal, cultural and heritage values of these water sources		12(f) change in the extent to which native title rights requirements have been met 12(i) change in the extent to which water has been made available in recognition of the Aboriginal cultural and heritage values of these waters
10(c) manage these water sources to ensure equitable sharing between users[314]	(c) identify water requirements for access licences (d) establish rules for granting of access licences and approvals (g) establish rules for the operation of water accounts	12(f) change in the extent to which domestic and stock rights have been met
10(d) protect basic landholder rights	(b) identify water requirements for basic landholder rights	12(f) change in the extent to which domestic and stock rights have been met
10(e) provide opportunities for market-based trading of access licences and water allocations within sustainability and system constraints	(i) establish access licence dealing rules	12(g) change in economic benefits derived from water extraction and use

314 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	Plan strategy	Stated Plan performance indicator
The vision of this Plan is to provide for healthy and enhanced water sources and water dependent ecosystems and equitable water sharing among users in the Richmond River Area Unregulated, Regulated and Alluvial Water Sources.		
10(f) provide enough flexibility in water account management to encourage responsible use of available water		12(h) change in economic benefits derived from water extraction and use
10(g) provide recognition of the connectivity between surface water and groundwater		No performance indicator available
10(h) adaptively manage these water sources	(j) establish performance indicators (k) identify triggers for and limits to changes to the rules in this Plan	No performance indicator available

Table 8: Objectives, strategies and indicators in the Tweed Plan

Stated Plan objective	Plan strategy	Stated Plan performance indicator
The vision of this Plan is to provide for healthy and enhanced water sources and water dependent ecosystems and equitable water sharing among users in the Tweed River Area Unregulated and Alluvial Water Sources.		
10 (a) protect, preserve, maintain and enhance the important river flow dependent and high priority groundwater dependent ecosystems of these water sources	(a) establish environmental water rules (e) establish rules that place limits on the availability of water for extraction (f) establish rules for making available water determinations (h) establish rules which specify the circumstances under which water may be extracted	12(a) change in low flow regime 12(b) change in moderate to high flow regime 12(c) change in surface water and groundwater extraction relative to the long-term average annual extraction limit 12(d) change in water quality in these water sources 12(e) change in the ecological condition of these water sources and their dependent ecosystems
10(b) protect, preserve, maintain and enhance the Aboriginal, cultural and heritage values of these water sources		12(h) change in the extent to which native title rights requirements have been met 12(i) change in the extent to which water has been made available in recognition of the Aboriginal cultural and heritage values of these waters
10(c) protect basic landholder rights	(b) identify water requirements for basic landholder rights	12(f) change in the extent to which domestic and stock rights have been met

Stated Plan objective	Plan strategy	Stated Plan performance indicator
The vision of this Plan is to provide for healthy and enhanced water sources and water dependent ecosystems and equitable water sharing among users in the Tweed River Area Unregulated and Alluvial Water Sources.		
10(d) manage these water sources to ensure equitable sharing between users[315]	(c) identify water requirements for access licences (d) establish rules for granting of access licences and approvals (g) establish rules for the operation of water accounts	(d) change in local water utility access (f) change in the extent to which domestic and stock rights have been met (g) the extent to which local water utility requirements have been met
10(e) provide opportunities for market-based trading of access licences and water allocations within sustainability and system constraints	(i) establish access licence dealing rules	12(g) change in economic benefits derived from water extraction and use
10(f) provide water allocation account management rules which allow sufficient flexibility to encourage responsible use of available water	(d) establish rules for granting of access licences and approvals	12(h) change in economic benefits derived from water extraction and use
10(g) contribute to the maintenance of water quality		No performance indicator available
10(h) provide recognition of the connectivity between surface water and groundwater		No performance indicator available
10(i) adaptively manage these water sources	(j) establish performance indicators (k) identify triggers for and limits to changes to the rules in this Plan	No performance indicator available
(j) contribute to the environmental and other public benefit outcomes identified under the *Water Access Entitlements and Planning Framework in the Intergovernmental Agreement on a National Water Initiative (2004)*		

315 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).

Appendix B – Water sources

Table 9: Richmond Plan water sources

Richmond Plan area water sources	
Richmond River extraction management unit	Alstonville Area Water Source (E) Bangalow Area Water Source (I) (E) Broadwater Area Water Source (I) Coopers Creek Alluvial Groundwater Source Coopers Creek Water Source (I) (E) Coraki Area Water Source (I) (E) Double Duke Area Water Source Doubtful Creek Water Source Eden Creek Water Source Gradys Creek Water Source (I) (E) Kyogle Area Water Source (I) (E) Lennox Area Water Source (I) Leycester Creek Water Source Myall Creek Water Source Myrtle Creek Water Source Sandy Creek Water Source Shannon Brook Water Source Terania Creek Water Source (I) (E) Toonumbar Area Water Source (I) Tuckean Area Water Source (E) Upper Richmond River Water Source (I) (E) Wyrallah Area Water Source (E) Richmond Regulated Alluvial Water Source
Evans River Catchment extraction management unit	Evans River Water Source (I)
Richmond Regulated extraction management unit	Richmond Regulated Water Source

Note: (I) denotes high in-stream value; (E) denotes high level of economic significance[316]

316 DPI-Water (2016) *Water Sharing Plan for the Richmond River Unregulated, Regulated and Alluvial Water Sources – Background document for amended plan 2016*. Available at: https://www.industry.nsw.gov.au/__data/assets/pdf_file/0007/166876/richmond-river-unreg-reg-alluvial-background.pdf.

Table 10: Tweed Plan water sources

Plan area water sources	
Tweed River Catchment extraction management unit	Bilambil Creek Water Source Brays Creek Water Source Byrrill Creek Water Source (I) Cobaki Broadwater Water Source (E) Cobaki Creek Water Source Crystal Creek Water Source (E) Doon Doon Creek Water Source Dunbible Creek Water Source (E) Dungay Creek Water Source (E) Duroby Creek Water Source (E) Hopping Dicks Creek Water Source (E) Lower Oxley River Water Source Mid Rous River Water Source Mid Tweed River Water Source (I) (E) Nobbys Creek Water Source Piggabeen Creek Water Source (E) Pumpenbil Creek Water Source Rolands Creek Water Source Smiths Creek Water Source Terranora Broadwater Water Source (E) Tweed Estuary Water Source Upper Oxley River Water Source Upper Rous River Water Source Upper Tweed River Water Source
Clothiers Creek Catchment extraction management unit	Clothiers Creek Water Source (E) Cudgen Lake Water Source (E)
Burringbar River Catchment extraction management unit	Burringbar River Water Source (E) Christies Creek Water Source (E) Cudgera Creek Water Source Mooball Creek Water Source Sheens Creek Water Source (E)

Note: (I) denotes high in-stream value; (E) denotes high level of economic significance[317]

317 NSW Office of Water (2010) *Water Sharing Plan, Tweed River Area Unregulated and Alluvial Water Sources Background document*. Available at: http://www.water.nsw.gov.au/__data/assets/pdf_file/0004/549418/wsp_tweed_river_background.pdf.