

Final report

**Review of water sharing plans for the  
Bega and Brogo Rivers Area,  
Murrumbidgee Area, and  
Towamba River water sources**

May 2021



## **Acknowledgement of Country**

The Natural Resources Commission acknowledges and pays respect to First Peoples. The Commission recognises that traditional owners have a deep and ongoing 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.

For this review, the Commission pays its respects to the Yuin and Monaro Nations' 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 Traditional Owners, 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 <i>Water Management Act 2000</i> (NSW)
AWD	Available water determination
Bega Brogo Plan	<i>Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources 2011</i>
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
GRP	Gross Regional Product
GSP	Gross State Product
HEVAE	High Ecological Values Aquatic Ecosystem
LALC	Local Aboriginal Land Council
LGA	Local government area
LTADEL	Long-term annual average extraction limit
MER	Monitoring, evaluation and reporting
ML	Megalitre (unit of volume equivalent to one million ( $1 \times 10^6$ ) litres)
Murrah-Wallaga Plan	<i>Water Sharing Plan for the Murrah-Wallaga Area Unregulated and Alluvial Water Sources 2010</i>
NARClIM	NSW and ACT Regional Climate Modelling Project
NRAR	Natural Resource Access Regulator
NSW	New South Wales
SEPP	State Environmental Planning Policy
R/ SA	Recommendation/ Suggested action
SMART	Specific, measurable, achievable, relevant and time-bound
Towamba Plan	<i>Water Sharing Plan for the Towamba River Unregulated and Alluvial Water Sources 2010</i>

The Plans

The Bega Brogo, Murrah-Wallaga and Towamba Plans

## Table of Contents

<b>Executive summary</b>	<b>1</b>
<b>1 Review background</b>	<b>9</b>
1.1 Water sharing plans and the Commission's role	9
1.2 Review approach	10
<b>2 Plan areas</b>	<b>12</b>
2.1 Bega Brogo Plan area and water sources	12
2.2 Murrah-Wallaga Plan area and water sources	15
2.3 Towamba Plan area and water sources	17
2.4 Water storages and town water supply systems	20
2.5 Environmental context	22
2.6 Climate	24
2.7 Aboriginal context	26
2.8 Socio-demographic context	28
2.9 Economic context	29
2.10 Impact of 2019-20 bushfires	34
<b>3 Overall advice on extension and replacement</b>	<b>36</b>
3.1 The Plans should be extended and replaced to address key risks	36
3.2 Regional planning activities should inform the revised Plans	37
3.3 Overall recommendation	38
<b>4 Ensuring sustainable extraction</b>	<b>39</b>
4.1 Plans lack sustainable, numeric LTAAELs	40
4.2 All basic landholder rights extraction must be accounted for	42
4.3 Brogo Dam allocations need to consider extreme droughts	44
4.4 Improved drought management tools should be implemented	45
4.5 AWDs in unregulated rivers and alluvial water sources	46
4.6 Recommendations	47
<b>5 Enhancing economic opportunity while reducing stress on low flows</b>	<b>48</b>
5.1 High flow conversion provisions have not been effective in reducing pressure on low flows	49
5.2 High flow LTAAEL could relieve pressure on low flows	50
5.3 Additional access to high flows via licenced farms dams should be considered where appropriate	52
5.4 Provisions may unnecessarily inhibit trade	61
5.5 Recommendations	65
<b>6 Environmental protections</b>	<b>66</b>
6.1 Protection of low flows should be reviewed	66
6.2 Assessment and monitoring of environmental assets could be improved	68
6.3 Work to maintain good estuarine condition should continue	71

6.4	Management of connectivity can be improved	75
6.5	Protections for GDEs can improve	80
6.6	Cochrane Dam environmental flow rules should be reviewed	83
6.7	Impacts of bushfires should be considered in remaking plans	86
6.8	Recommendations	88
<b>7</b>	<b>Town water supply</b>	<b>91</b>
7.1	Risks from bushfires and other emergencies should be considered	91
7.2	There are stakeholder concerns around meeting peak daily needs	93
7.3	Plan rules for town water supply must consider latest data	94
7.4	Efforts should continue to address water quality risks	96
7.5	Risks from saltwater intrusion should be monitored	97
7.6	Recommendations	98
<b>8</b>	<b>Aboriginal water rights, values, and uses</b>	<b>99</b>
8.1	Native title needs recognition	100
8.2	Known Aboriginal values are not protected by the Plans	101
8.3	Licences are difficult to access and use	104
8.4	Recommendations	106
<b>9</b>	<b>Opportunities to improve MER and implementation</b>	<b>107</b>
9.1	Strengthening MER	107
9.2	Strengthening implementation	108
9.3	Recommendation	109
<b>10</b>	<b>Compensation implications of recommendations</b>	<b>110</b>
	<b>Appendix A - Plan objectives, strategies and indicators</b>	
	<b>Appendix B - Water sources</b>	
	<b>Appendix C - Estuaries of the south coast plan area</b>	
	<b>Appendix D - Extraction sensitive environmental assets of the south coast plan area</b>	
	<b>Appendix E - Case study: Aboriginal fishing on the south coast</b>	

## Executive summary

The Natural Resources Commission (the Commission) has reviewed:

- the *Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources 2011* (the Bega Brogo Plan)
- the *Water Sharing Plan for the Murrumbidgee Area Unregulated and Alluvial Water Sources 2010* (the Murrumbidgee Plan)
- the *Water Sharing Plan for the Snowy Mountains River Unregulated and Alluvial Water Sources 2010* (the Snowy Mountains Plan).

in the NSW South Coast region,<sup>1</sup> 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 plan areas were significantly affected by bushfires in 2019-20 after experiencing a severe drought. It was evident from engagement during this review that the impacts of these events are far reaching and ongoing for communities and the catchments. The Commission has considered how the Plans can contribute to increased resilience and improved emergency management in the future. The Commission would like to thank stakeholders for their input, particularly given the significant hardships they have faced.

The Commission identified several examples of good practice and positive outcomes in this review, including a 'source to sea' approach that includes estuaries in plan boundaries, the delivery of end of system flows and consideration of connectivity and climate change. DPIE-Water and DPIE-Fisheries are also establishing water requirements for coastal aquatic species and completing mapping to identify where these species are located. While outside of the scope of the Plans, work to improve riparian condition led by industry in partnership with government and community is helping to maintain the relatively good condition of waterways in the region.

While recognising the strengths of the Plans, the Commission has identified several opportunities to improve outcomes that justify replacing the Plans. The Commission recommends an extension of two years to the existing Plans to allow time to undertake required data collection and analysis, completion of the *South Coast Regional Water Strategy* and development of the replacement Plans. These opportunities are based on new information and the lessons learned from implementing the Plans, particularly during drought and severe bushfires.

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

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<sup>1</sup> The term 'the Plans' is used when speaking broadly across the Bega Brogo, Murrumbidgee and Snowy Mountains plans.

**Figure 1: Key areas to improve Plan performance on the South Coast**

	<p><b>Extraction limits</b></p> <p>The Plans lack sustainable, numerically defined long-term average annual extraction limits (LTAAELs), which may lead to negative environmental outcomes, or unnecessarily restrict trade. Brogo Dam is small relative to the entitlement in the system and available water determinations (AWDs) have been well below 100 percent for the life of the Bega Brogo Plan. The most recent drought demonstrated that estimates of inflows and losses used for determining AWDs should be reviewed based on recent data, and that a more proactive approach to adjusting allocation during drought is needed.</p>
	<p><b>Enhancing economic opportunities while reducing low flow pressures</b></p> <p>Pressure on low flows risks environmental outcomes and creates community tensions. There may be an opportunity to reduce pressure on low flows by allowing increased extraction of runoff via licenced farm dams in high flows. It will be necessary to conduct modelling to determine that this does not compromise high flow dependent environmental values. Incorporating a high flow LTAAEL as a component of the overall LTAAEL and reviewing the trade boundaries may also provide for enhanced economic opportunities and help reduce pressure on low flows.</p>
	<p><b>Strengthening environmental protections</b></p> <p>More work is needed to establish evidence-based flow requirements and associated provisions for flow dependent environmental assets across the south coast plans. This includes consideration of estuarine flow requirements to ensure their current good condition is maintained. The needs of environmental systems post-bushfire should be considered. The Commission has also made recommendations to strengthen the protection and management of groundwater dependent ecosystems (GDEs), connectivity, other environmental assets and environmental flows from Brogo and Cochrane Dam.</p>
	<p><b>Securing town water supply</b></p> <p>Town water supply needs were mostly met over the life of the Plans. However, recent pressures from drought and bushfire have highlighted several issues that should be addressed, particularly to ensure risks from climate change and variability can be managed. The replacement Plans should consider the latest data on climate and flows and address risks to town water supply in emergency situations and for meeting peak daily demand. The replacement Plans should also complement planned infrastructure, including water treatment plant upgrades, support the management of water quality issues (including from the bushfires) and monitor and plan for risks from saltwater intrusion of the Mid Bega River Sands aquifer.</p>





## Improving outcomes for Aboriginal people

State-wide issues relating to Aboriginal water values, right and uses remain, with work to be done to develop and resource proactive involvement of Aboriginal people in coastal water planning and management. The Plans do not recognise the large native title claim of the South Coast People and do not protect known Aboriginal water values. The complexity of, and limitations on, Aboriginal specific water licences inhibit any meaningful uses by Aboriginal people.

**Table 1: Recommendations**

Overall recommendation	
<b>Recommendation (R) 1 – All Plans</b>	<p>The Plans should be:</p> <ul style="list-style-type: none"> <li>a) extended for a further two years until 30 June 2023, to allow time to complete data collection, analysis and modelling</li> <li>b) replaced by 1 July 2023 supported by the completion of the recommendations of this review and consideration of outcomes from the <i>South Coast Regional Water Strategy</i> and other regional planning initiatives where relevant.</li> </ul>
Ensuring sustainable extraction	
<b>R 2 – All Plans</b>	<p>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:</p> <ul style="list-style-type: none"> <li>a) establish and publish sustainable fixed, numeric LTAAELs, ensuring they are based on best available information, including ecological requirements, an accurate estimate of basic landholder rights and climate change</li> <li>b) 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.</li> </ul>
<b>R 3 – Bega Brogo</b>	<p>To improve the effectiveness of water management during drought, DPIE-Water should:</p> <ul style="list-style-type: none"> <li>a) assess level of risk desired in balancing water security and availability for extraction for managing for drought response</li> <li>b) based on the outcomes of (a) review the AWD provisions for Brogo Dam, considering lessons from the recent drought, increased understanding of climate and river losses</li> <li>c) include provisions in the remade Plan that identify clear triggers for adjusting access to water allocation during drought.</li> </ul>
<b>R4 – Bega Brogo</b>	<p>By 1 July 2023, to reduce pressure on low flows and enhance economic opportunities, DPIE-Water should:</p>

	<ul style="list-style-type: none"> <li>a) investigate the feasibility of setting a high flow LTAAELs as a component of overall LTAAEL</li> <li>b) undertake further modelling to investigate the potential for increased access to high flow runoff via licensed farm dams to be used as tool to shift water users out of extraction of low flows within the Bega Brogo Plan area. Modelling or further analysis should consider the impact of: <ul style="list-style-type: none"> <li>- excluding extraction at low flows under the assumption of users migrating to diversion of high flows</li> <li>- benefits and costs of implementation of low flow bypasses on dam infrastructure</li> <li>- proposed changes on end of system flows and flow requirements for the protection of environmental assets</li> </ul> </li> <li>c) determine the metering and monitoring requirements that would be needed to implement high flow access options and assess their feasibility.</li> </ul>
<p><b>R 5 - All Plans</b></p>	<p>By 1 July 2023, DPIE-Water should complete their review of trade for coastal catchments and review and address trade barriers for these plans, including but not limited to options to combine water sources and increase flexibility to trade into high flows. Any changes to trade rules should maintain protections for high-value aquatic ecosystems and cultural values, including considering latest HEVAE mapping and risk assessments.</p>
<p><b>Strengthening environmental protections</b></p>	
<p><b>R 6 - All Plans</b></p>	<p>To ensure estuary condition is maintained in the Plan areas, DPIE-Water should:</p> <ul style="list-style-type: none"> <li>a) by 1 July 2023, establish clear objectives and estuarine flow requirements for estuaries across the Plan areas</li> <li>b) by 1 July 2023, include provisions to achieve the estuarine flow requirements defined in (a), including clear agency responsibilities</li> <li>c) use data from the DPIE-EES estuarine monitoring program and NSW Food Authority to monitor estuarine condition and identify changes to estuarine condition that may be impacted by the Plans. Plan provisions should be adjusted as required to ensure that there is sufficient planned environmental water to respond to the needs of these estuaries.</li> </ul>
<p><b>R 7 - All Plans</b></p>	<p>By 1 July 2023, to ensure threatened species and endangered ecological communities are protected, DPIE-Water should:</p> <ul style="list-style-type: none"> <li>a) finalise work to establish environmental flow requirements<sup>2</sup> for coastal aquatic species and ensure that plan rules adequately protect them</li> <li>b) amend plan rules (for example, cease to pump rules and TDELs) where evidence indicates unacceptable impact on low flows</li> <li>c) implement monitoring within the plan areas at key strategic locations where significant extraction overlays high environmental values</li> <li>d) complete HEVAE mapping so that there is an updated assessment of strategic monitoring locations</li> </ul>

<sup>2</sup> Flow requirements may include any part of the flow duration curve that is a low flow, large fresh or small fresh

	<ul style="list-style-type: none"> <li>e) update any necessary plan provisions to account for protection of threatened species where updated HEVAE assessment and extraction pressure information identifies that current rules are insufficient</li> <li>f) ensure alignment with environmental objectives outlined in relevant NSW Government strategic plans including the Batemans Marine Park Operational Plan.</li> </ul>
<p><b>R 8 – All Plans</b></p>	<p>By 1 July 2023, to improve the management of connectivity to protect water sources and dependent ecosystems, DPIE-Water should:</p> <ul style="list-style-type: none"> <li>a) use best available evidence and undertake additional required studies to identify highly connected systems, including the Mid Bega River Sands</li> <li>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 in (a) as being highly connected and stage access rules for existing bores</li> <li>c) determine the level of connectivity between the aquifers and rivers in the Plans and Coastal Sands aquifers and, if highly connected, provide protection</li> <li>d) include comprehensive definitions for surface-groundwater connectivity in the Plan dictionaries.</li> </ul>
<p><b>R 9 – All Plans</b></p>	<p>By 1 July 2023, to improve the management of GDEs, DPIE-Water should:</p> <ul style="list-style-type: none"> <li>a) map and ground-truth the presence and extent of GDEs, including estuarine and coastal ecosystems and define their groundwater requirements</li> <li>b) clearly define groundwater terms and their relevance to the Plans, including GDE priority and types (including high-priority GDEs)</li> <li>c) review the GDEs in the <i>South Coast Groundwater Plan</i> and where appropriate recognise them in the South Coast replacement Plans</li> <li>d) review setback distances for work near identified GDEs and standardise them based on the <i>NSW Aquifer Interference Policy 2012</i>.</li> </ul>
<p><b>R 10 – Bega Brogo Plan</b></p>	<p>To ensure environmental flows and drought reserves from Cochrane Dam deliver environmental and social outcomes downstream, DPIE-Water should:</p> <ul style="list-style-type: none"> <li>a) use best available information to investigate the need and options to increase the Cochrane Dam drought reserve, including consideration of: <ul style="list-style-type: none"> <li>- the adequacy of the drought reserve volume for a range of climatic scenarios</li> <li>- revising the definition and triggers (for storing and release) of the drought reserve</li> <li>- lessons from the recent drought (including system losses) and up to date data on environmental and critical human needs.</li> </ul> </li> <li>b) review daily flow releases from Cochrane Dam (including current timing and release volumes) based on a better understanding of environmental needs and the latest flow data.</li> <li>c) by 1 July 2023, as part of the Bega Brogo Plan replacement: <ul style="list-style-type: none"> <li>- include any necessary changes to provisions based on (a) and (b)</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>- formalise the flow targets at Kanoona currently outlined in the Background Document but not included as a provision in the Plan</li> <li>- ensure roles and responsibilities for reserve and releases are clearly stated in the Plan.</li> </ul>
<b>R 11 - All Plans</b>	<p>By 1 July 2023, to assist the environment in recovering from bushfires and minimise future risks, DPIE-Water should:</p> <ul style="list-style-type: none"> <li>a) collaborate with DPI-Fisheries and DPIE-ESS to better understand the impacts of bushfires on aquatic species and determine any specific flow requirements that may aid recovery (e.g. cues for fish spawning)</li> <li>b) include a provision that can be triggered to support the protection of particular flow events to aid the post-fire recovery of aquatic ecosystems.</li> </ul>
<b>Suggested action (SA) A</b>	NSW agencies continue to work with landholders to support riparian management throughout the catchments.
<b>Securing town water supply</b>	
<b>R 12 - All Plans</b>	<p>DPIE-Water should continue to work with Bega Valley Shire Council as part of the regional water strategy process and Plan remakes to improve town water supply systems and access. This should include:</p> <ul style="list-style-type: none"> <li>a) revisiting the assignment of TDELs to ensure that they are sustainable and don't unnecessarily constrain town water supply needs on a daily basis or compromise environmental values or other water users (notably domestic and stock use)</li> <li>b) consideration of an emergency management provision that, when triggered, allows the local water utility to temporarily draw on individual water sources in emergency situations</li> <li>c) investigating revision of Plan provisions that provide Bega Valley Shire Council with the flexibility to optimise its water supply systems to meet peak daily demand and critical human water needs in emergency situations</li> <li>d) ensuring that plan provisions are based on best available information including: <ul style="list-style-type: none"> <li>- up-to-date flow data</li> <li>- Bega groundwater modelling, including scenarios around increasing individual and total daily extraction limits and where possible, using these models to undertake more detailed assessment of the risks of saline intrusion of water sources used for groundwater</li> <li>- latest climate data, including stochastic modelling of climate change undertaken as part of the <i>South Coast Regional Water Strategy</i></li> </ul> </li> <li>e) developing a salinity based cease to pump target for the Mid Bega River Sands and support ongoing monitoring of salinity to detect saltwater intrusion.</li> </ul>
<b>SA B</b>	DPIE-Water should consider simplifying the process for developing and implementing Integrated Water Cycle Management Strategies and assist with upskilling local water utilities in developing and implementing strategies.

<b>Improving outcomes for Aboriginal people</b>	
<b>R 13 - All Plans</b>	DPIE-Water should amend all Plans to acknowledge the registered native title claim for the South Coast People. Sufficient additional time should be allowed to undertake detailed engagement with Traditional Owners on options to support these values and uses (including fishing) and make any final amendments.
<b>R 14 - All Plans</b>	<p>In order to better achieve cultural outcomes, by 1 July 2023, DPIE-Water should:</p> <ul style="list-style-type: none"> <li>a) identify and protect known high value cultural sites in the replacement Plans</li> <li>b) undertake further work with a range of Aboriginal knowledge holders, including Aboriginal women, to better understand water values and uses (including fishing), identify and protect them, and better support water access and use</li> <li>c) ensure that where additional allocations become available within the south coast Plans the Aboriginal water needs including any cultural water allocations are assessed as a priority</li> <li>d) undertake state-wide actions identified in previous Commission water sharing plan reviews<sup>3</sup> to improve consideration and respect for native title and Aboriginal values in water sharing plans and ensure these are included in the NSW Aboriginal Water Strategy.</li> </ul>

<sup>3</sup> At a minimum, include actions to:

- Establish common provisions to undertake preliminary amendments to a plan within six months of a registered native title claim or determination. Allow for additional time to undertake detailed engagement with Traditional Owners to make any specific water allocations and final amendments to the plan required.
- Proactively consider native title claims, Indigenous Land Use Agreements or other land and water agreements wherever possible as part of the planning, drafting and engagement process for plans.
- Work to identify Aboriginal values and uses, objectives and outcomes in all plan areas through extensive engagement with local Aboriginal knowledge holders including Aboriginal women – include linked strategies, indicators and monitoring plans to ensure these are met.
- Use well-evidenced cultural flow and country-based principles and processes for identifying, protecting, and monitoring Aboriginal water values and outcomes.
- Co-design options to support a wide range of cultural, environmental, social and economic water values and uses – e.g. volumetric allocations from unallocated flows; water purchase or transfer of licenses; improved licensing; other water custodianship that is non-volumetric/non-licensed; commercial and trading options.
- Identify and support the appropriate infrastructure, resources and education needed to support Aboriginal water access and use.
- Co-design and deliver awareness-raising, capability-building and education measures on water sharing, planning and management in NSW.
- Support Aboriginal ownership, management and leadership in water and ensure this is well-resourced – to help meet Closing the Gap targets.
- Consider, prioritise and commit to changes to legislation and policy that are needed to support these actions.

MER and implementation	
<b>R 15* - All Plans</b>	By 1 July 2023, to improve MER and Plan implementation continue to implement state-wide recommendations and suggested actions made in previous Commission water sharing plan reviews (see for reference <b>R 18</b> and <b>SA G-K</b> in the Commission's <i>Review of the water sharing plans for the Richmond and Tweed unregulated and alluvial water sources – Final Report</i> ).
<b>SA C - All Plans</b>	DPIE-Water work with other agencies, including DPIE-Fisheries and DPIE-EES to implement MER programs to examine bushfire impacts and potential implications for plan rules to aid recovery of aquatic ecosystems.

# 1 Review background

## 1.1 Water sharing plans and the Commission's role

Water sharing plans are statutory instruments under the *Water Management Act 2000* (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 Murrah-Wallaga and Towamba Plans commenced on 17 December 2010. The Bega Brogo Plan commenced on 1 April 2011. All Plans are due to expire 30 June 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.<sup>4</sup> Under the Act, compensation is payable by the state to access licence holders only in certain circumstances<sup>5</sup> where water allocations under a water sharing plan are reduced.

The Commission must also consider the water management principles,<sup>6</sup> 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:

- sharing of water from a water source must protect the water source and its dependent ecosystems, and
- sharing of water from a water source must protect basic landholder rights, and
- sharing or extraction of water under any other right must not prejudice the principles set out in paragraphs (a) and (b).<sup>7</sup>

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<sup>4</sup> 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.

<sup>5</sup> 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.

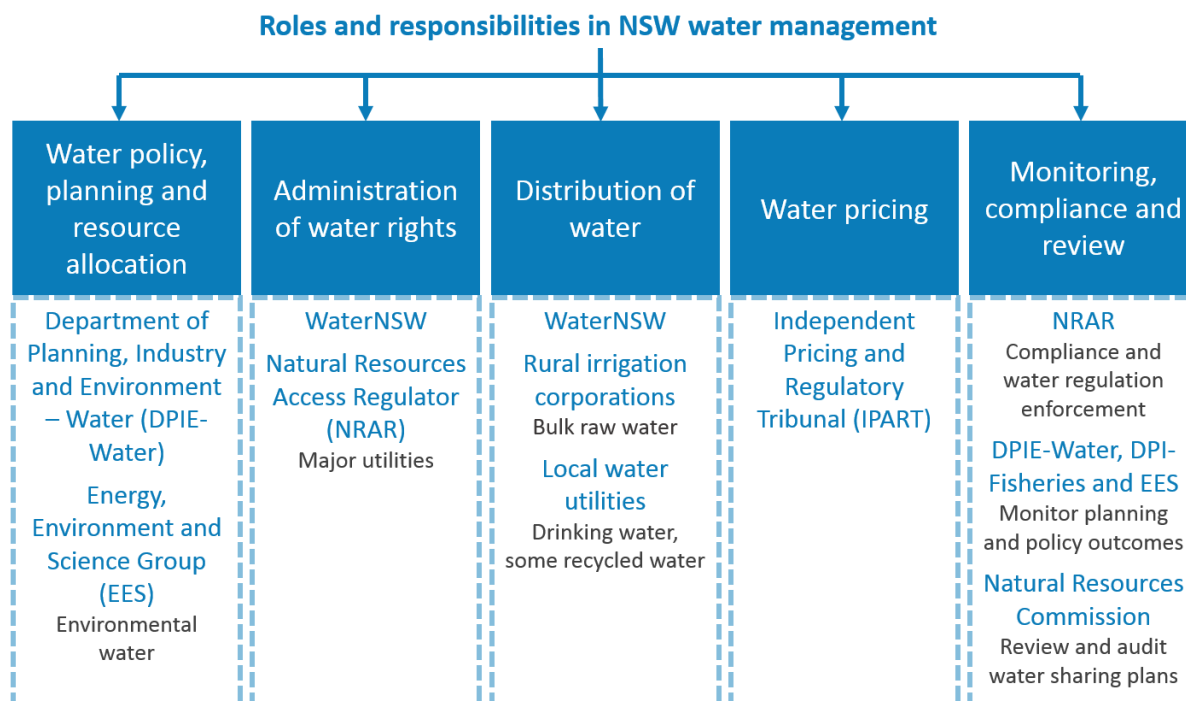
<sup>6</sup> Section 5 of the Act.

<sup>7</sup> Section 5(3) of the Act.



Further, the water management principles should be prioritised in the order that they are set out above.<sup>8</sup> Water sharing plans must be based on evidence to achieve these outcomes.

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



**Figure 2: Roles and responsibilities in rural and regional water management<sup>9</sup>**

## 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.

<sup>8</sup> Section 9(1) of the Act.

<sup>9</sup> Revised from Department of Industry - 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](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0019/218404/NSW-Regional-Water-Statement.pdf).



- **Technical advice** – consultants provided expert analysis on 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 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 seven submissions on the Bega Brogo Plan, four on the Murrah Wallaga Plan and seven on the Towamba Plan. Non-confidential submissions are published on the Commission’s website.<sup>10</sup>

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.

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<sup>10</sup> 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 section gives an overview of the Plan areas and their water-dependent environmental, social and economic values.

### 2.1 Bega Brogo Plan area and water sources

The Bega Brogo Plan covers the 1,940 square kilometre Bega River Catchment on NSW South Coast (**Figure 3**).<sup>11</sup> Local centres include Bega, Brogo and Candelo. The Bega Brogo Plan covers 12 water sources managed under two extraction management units:

- **Bega and Brogo Regulated Rivers Extraction Management Unit** – the Regulated Brogo and Bega Rivers Water Source, which covers the Brogo River downstream of Brogo Dam (see **Appendix B**)<sup>12</sup>
- **Bega River Catchment Extraction Management Unit** – covers all other water sources, including the unregulated rivers and groundwater.

The main waterway is the Bega River, which has two main arms:

- The Bega-Bemboka arm, which is mainly unregulated with flows supplemented by releases from Cochrane Dam. This arm has large areas of tablelands and several large tributaries (including Sandy, Tantawangalo and Wolumla creeks).
- The Brogo River, which is regulated by Brogo Dam. The Brogo River has less tableland areas. Double Creek is the major tributary.<sup>13</sup>

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<sup>11</sup> Office of Water (2011) *Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources – Background document*. Available at:  
[http://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0006/547287/wsp\\_bega\\_background.pdf](http://www.water.nsw.gov.au/__data/assets/pdf_file/0006/547287/wsp_bega_background.pdf).

<sup>12</sup> *Ibid*

<sup>13</sup> *Ibid*



**Figure 3: Map showing the Bega Brogo Plan area, including local government areas (LGAs) and national parks<sup>14</sup>**

<sup>14</sup> Map developed by the Commission from publicly available NSW and Australian government data.

The plan area includes the Mid Bega River Sands, an alluvial aquifer which is an important water source for town water supply and irrigation.<sup>15</sup>

Of the south coast plans, the Bega Brogo Plan has the most significant volume of licenced entitlement and as such is the focus of water extraction across the Bega Valley. **Table 2** shows the breakdown of licence entitlements for the Bega Brogo Plan as at March 2021, totalling 46,359 ML per year.<sup>16</sup> Unregulated river licences hold the largest entitlement at 24,982 ML, or 54 percent of the total entitlement. The Commission noted some discrepancies with the entitlement listed in the Bega Brogo Plan and information available through the water licensing system. These discrepancies are outlined in **Table 2**. In the absence of clarification of reasons for these discrepancies, the figures outlined in the Plan have been used as the entitlement on issue. These discrepancies should be resolved in the remake of the Plan.

**Table 2: Breakdown of entitlement<sup>17</sup> by licence category for the Bega Brogo Plan area**

Category	Entitlement (as listed in the WSP)	Entitlement based on WaterNSW Water Licensing System	Number of licences
Local water utility	4,906	4,906 <sup>18</sup>	4
Domestic and stock access licences	342	347	89
Unregulated river	24,975	24,982	237
Aquifer	1,003	850	6
Regulated river (general security)	13,954	13,907	78
Regulated river (high security)	473	413	29
Supplementary	1,305	1,300	18
<b>Total licence entitlement</b>	<b>46,959</b>	<b>46,359</b>	<b>372</b>

### 2.1.1 History of water planning in the Bega-Brogo Plan area

The Commission acknowledges that the Bega-Brogo Plan drew on expertise and decisions reached through historical river management plans and studies undertaken in the catchment area. A summary of these are as follows:

- Bega-Bemboka River Flow Plan (Flow Plan): The Flow Plan was developed between 1996 and 1998 by the Bega Valley Water Management Committee, which included

<sup>15</sup> Office of Water (2011) *Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources – Background document*. Available at: [http://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0006/547287/wsp\\_bega\\_background.pdf](http://www.water.nsw.gov.au/__data/assets/pdf_file/0006/547287/wsp_bega_background.pdf).

<sup>16</sup> Data provided by WaterNSW from its Water Licensing System, as at 24 March 2021.

<sup>17</sup> Entitlement is provided as ML for local water utility licences and domestic and stock access licences. For aquifers, unregulated river and regulated river licences entitlement is issued as a unit share with the volume provided per unit share impacted by the available water determination.

<sup>18</sup> Local water utility licences are issued as 4,206ML of local water utility licences and 700ML of regulated river (town water supply) licences

representation from the Bega Valley Water Users Association, power station representatives, environmental interests, local government and state government agencies.<sup>19</sup> The Flow Plan identified environmental flow requirements and formalised rostering arrangements for the unregulated river via the establishment of daily extraction limits. The Flow Plan also established an agreement with Eraring Energy regarding storage and release of water from Cochrane Dam.<sup>20</sup> Daily extraction limits aimed to ensure the protection of environmental water via the maintenance of pools and riffles.<sup>21</sup> To enable the extraction rules including the triggers for cease to pump declarations, a river gauge was installed at Kanoona Rocks. As part of the Flow Plan irrigators were required to check daily restrictions prior to starting pumping.

- *Independent Inquiry into the Bega River System* by the Healthy Rivers Commission: the Healthy Rivers Commission concluded that the management of water extraction, wetlands, the estuary, river vegetation and environmental weeds could be improved.<sup>22</sup> The Healthy Rivers Commission supported the Flow Plan and proposed cease to pump levels for other water sources not covered by the Flow Plan.
- South Coast Water Management Committee: established by the Minister for Land and Water Conservation in 1999 to contribute to the preparation of water sharing plans.<sup>23</sup> The South Coast Water Management Committee was involved in development of rules to manage town water supply and extraction limits in the Bega-Brogo Plan. The Committee recommended a staged approach to introduction of limits in the Bega-Brogo plan to manage social and economic impacts and allow water users to adjust to the new plan rules.

## 2.2 Murrah-Wallaga Plan area and water sources

The Murrah-Wallaga Plan covers around 784 square kilometres in the Murray and Wallaga Lake catchments on the NSW South Coast (**Figure 4**).<sup>24</sup> Major towns include Cobargo and Bermagui.<sup>25</sup>

The Murrah-Wallaga Plan comprises 13 unregulated and alluvial water sources within one extraction management unit (see **Appendix B**). The majority of entitlement within the Murrah-Wallaga Plan occurs on the Dry River, Narira Creek and Bermagui River.

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<sup>19</sup> Baldwin, C., Hamstead, M and Uhlmann, V. (2008). Interjurisdictional analysis of community based governance arrangements for water resource management in Western Australia. A report prepared for the Department of Water, Western Australia. Available at [https://www.water.wa.gov.au/\\_\\_data/assets/pdf\\_file/0020/4475/97062.pdf](https://www.water.wa.gov.au/__data/assets/pdf_file/0020/4475/97062.pdf)

<sup>20</sup> Office of Water (2011) *Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources – Background document*. Available at:

[http://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0006/547287/wsp\\_bega\\_background.pdf](http://www.water.nsw.gov.au/__data/assets/pdf_file/0006/547287/wsp_bega_background.pdf)

<sup>21</sup> Baldwin, C., Hamstead, M and Uhlmann, V. (2008). Interjurisdictional analysis of community based governance arrangements for water resource management in Western Australia. A report prepared for the Department of Water, Western Australia. Available at [https://www.water.wa.gov.au/\\_\\_data/assets/pdf\\_file/0020/4475/97062.pdf](https://www.water.wa.gov.au/__data/assets/pdf_file/0020/4475/97062.pdf)

<sup>22</sup> Office of Water (2011) *Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources – Background document*. Available at:

[http://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0006/547287/wsp\\_bega\\_background.pdf](http://www.water.nsw.gov.au/__data/assets/pdf_file/0006/547287/wsp_bega_background.pdf)

<sup>23</sup> *Ibid*

<sup>24</sup> NSW Office of Water (2010) *Water Sharing Plan for the Murrah-Wallaga Area Unregulated and Alluvial Water Sources – Background document*. Available at:

[https://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0011/547904/wsp\\_murrah\\_wallaga\\_background.pdf](https://www.water.nsw.gov.au/__data/assets/pdf_file/0011/547904/wsp_murrah_wallaga_background.pdf)

<sup>25</sup> *Ibid*

**Table 3** shows the breakdown of the licence entitlements for the Murrumbidgee Plan as at March 2021, totalling 4,414 ML per year.<sup>26</sup> As highlighted in **Table 3**, unregulated river licences hold 92% of all entitlement on issue. The Commission noted some discrepancies with the entitlement listed in the Murrumbidgee Plan and information available through the water licensing system. These discrepancies are outlined in **Table 3**. In the absence of clarification of reasons for these discrepancies, the figures outlined in the Plan have been used as the entitlement on issue. These discrepancies should be resolved in the remake of the Plan.

**Table 3: Breakdown of entitlement<sup>27</sup> by licence category for the Murrumbidgee Plan area**

Category	Entitlement (as listed in the WSP)	Entitlement based on WaterNSW Water Licensing System	Number of licences
Local water utility	50	100	2
Domestic and stock access licences	295	180	32
Unregulated river	4,499	4,110	82
Aquifer	20	25	2
<b>Total licence entitlement</b>	<b>4,864</b>	<b>4,414</b>	<b>118</b>

### 2.2.1 History of water planning in the Murrumbidgee Plan area

The Murrumbidgee Plan was developed based on pre-existing water management arrangements and the Macro Planning approach.<sup>28</sup> Informal water sharing arrangements had been in place for many years prior to the Plan<sup>29</sup> and the South Coast Water Management Committee undertook negotiations to formalise these arrangements. Formal rules covered water users in the Dry River and Narira Creek catchments, which hold the majority of entitlement in this Plan.

<sup>26</sup> Data provided by WaterNSW from its Water Licensing System, provided 24 March 2021.

<sup>27</sup> Entitlement is provided as ML for local water utility licences and domestic and stock access licences. For aquifers, unregulated river and regulated river licences entitlement is issued as a unit share with the volume provided per unit share impacted by the available water determination.

<sup>28</sup> NSW Office of Water (2010). *Macro water sharing plans - the approach for unregulated rivers. A report to assist community consultation*. Available at <https://silos.tips/download/macro-water-sharing-plans-the-approach-for-unregulated-rivers>

<sup>29</sup> NSW Office of Water (2010) *Water Sharing Plan for the Murrumbidgee Area Unregulated and Alluvial Water Sources - Background document*. Available at: [https://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0011/547904/wsp\\_murrumbidgee\\_background.pdf](https://www.water.nsw.gov.au/__data/assets/pdf_file/0011/547904/wsp_murrumbidgee_background.pdf).

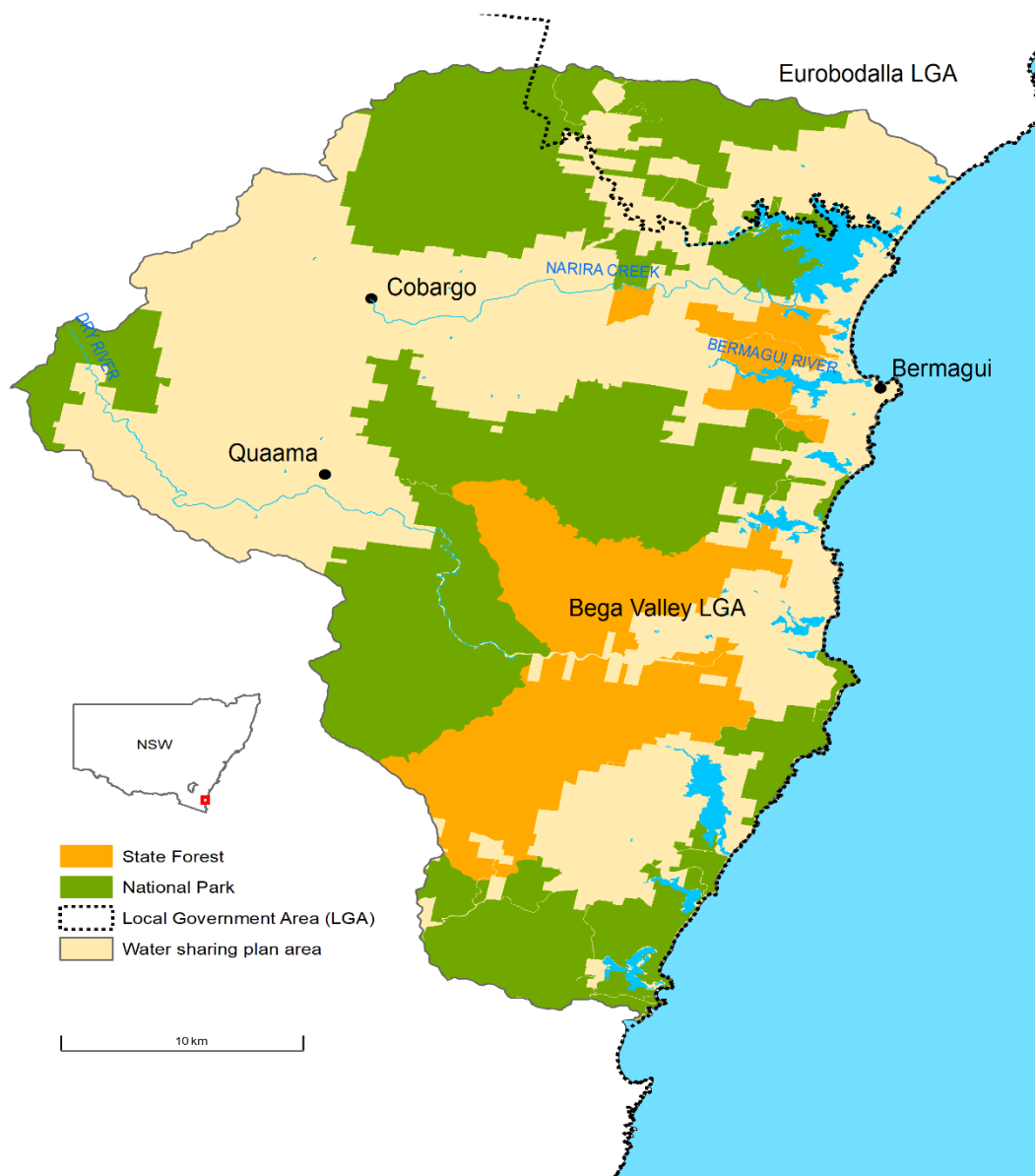


Figure 4: Map showing Murrah-Wallaga Plan area, including LGAs and national parks<sup>30</sup>

### 2.3 Towamba Plan area and water sources

The Towamba Plan covers 2,345 square kilometres across the Towamba Basin and several other coastal catchments to the north and south of the Towamba River on the NSW South Coast (Figure 5).<sup>31</sup> Major towns include Tathra, Merimbula, Pambula and Eden. The Towamba Plan covers 22 water sources managed under three extraction management units (see Appendix B).<sup>32</sup>

<sup>30</sup> Batemans Marine Park overlays the southern section of Wallaga Lake. Additional information on the Park is available at: <https://www.dpi.nsw.gov.au/fishing/marine-protected-areas/marine-parks/batemans-marine-park>

<sup>31</sup> Office of Water (2011) *Water Sharing Plan for the Towamba River Unregulated and Alluvial Water Sources – Background document*. Available at: [http://www.water.nsw.gov.au/\\_data/assets/pdf\\_file/0009/549198/wsp\\_towamba\\_river\\_background.pdf](http://www.water.nsw.gov.au/_data/assets/pdf_file/0009/549198/wsp_towamba_river_background.pdf).

<sup>32</sup> *Ibid*

There are three main catchments in the Towamba Plan area: the Towamba River, Wonboyn River and Pambula Lake.

**Figure 5** shows the breakdown of licence entitlements for the Towamba Plan as at March 2021, totalling 4,299 ML per year.<sup>33</sup> Unregulated river access licences comprise 53 percent of all entitlement on issue in the Plan. The Commission noted some discrepancies with the entitlement listed in the Towamba Plan and information available through the water licensing system. These discrepancies are outlined in **Table 4**. In the absence of clarification of reasons for these discrepancies, the figures outlined in the Plan have been used as the entitlement on issue. These discrepancies should be resolved in the remake of the Plan.

**Table 4: Breakdown of entitlement<sup>34</sup> by licence category for the Towamba Plan area**

Category	Entitlement (as listed in the WSP)	Entitlement based on WaterNSW Water Licensing System	Number of licences
Local water utility <sup>35</sup>	1,400	1,436	3
Domestic and stock access licences	320	66	26
Unregulated river	2,227	2,468	77
Aquifer	257	330	18
<b>Total licence entitlement</b>	<b>4,204</b>	<b>4,299</b>	<b>124</b>

### 2.3.1 History of water planning in the Towamba Plan area

The background document indicates that the Towamba Plan was developed based on the Macro Planning approach<sup>36</sup> and committee developed extraction rules for the Bega Valley Shire Council for extraction of water from the Kiah borefield for the Ben Boyd Dam.<sup>37</sup> Committee members involved in development of the extraction limits included the Bega Valley Shire Council, representatives of the regional panel and Kiah River Care Group.<sup>38,39</sup>

<sup>33</sup> Data provided by WaterNSW from its Water Licensing System, provided 24 March 2021.

<sup>34</sup> Entitlement is provided as ML for local water utility licences and domestic and stock access licences. For aquifers, unregulated river and regulated river licences entitlement is issued as a unit share with the volume provided per unit share impacted by the available water determination.

<sup>35</sup> Local water utility licences have been issued as aquifer (town water supply) 1,400ML and domestic and stock access licence (town water supply) 36ML. It is unclear why a town water supply licence has been issued under the domestic and stock access licence category.

<sup>36</sup> Office of Water (2010). *Macro water sharing plans - the approach for unregulated rivers. A report to assist community consultation*. Available at <https://silو.tips/download/macro-water-sharing-plans-the-approach-for-unregulated-rivers>

<sup>37</sup> Office of Water (2011) *Water Sharing Plan for the Towamba River Unregulated and Alluvial Water Sources – Background document*. Available at: [http://www.water.nsw.gov.au/\\_data/assets/pdf\\_file/0009/549198/wsp\\_towamba\\_river\\_background.pdf](http://www.water.nsw.gov.au/_data/assets/pdf_file/0009/549198/wsp_towamba_river_background.pdf).

<sup>38</sup> *Ibid*

<sup>39</sup> The Commission received a submission from a stakeholder group indicating that water sharing arrangements had informally been developed and accepted by community members that progressively reduced extraction with decreasing flows to maintain water for environmental health. This stakeholder group indicated that a lack of community ownership of the Plan has led to some issues with acceptance of Plan rules. This was not a view that was universally shared by all stakeholders, with varying levels of support for plan rules expressed



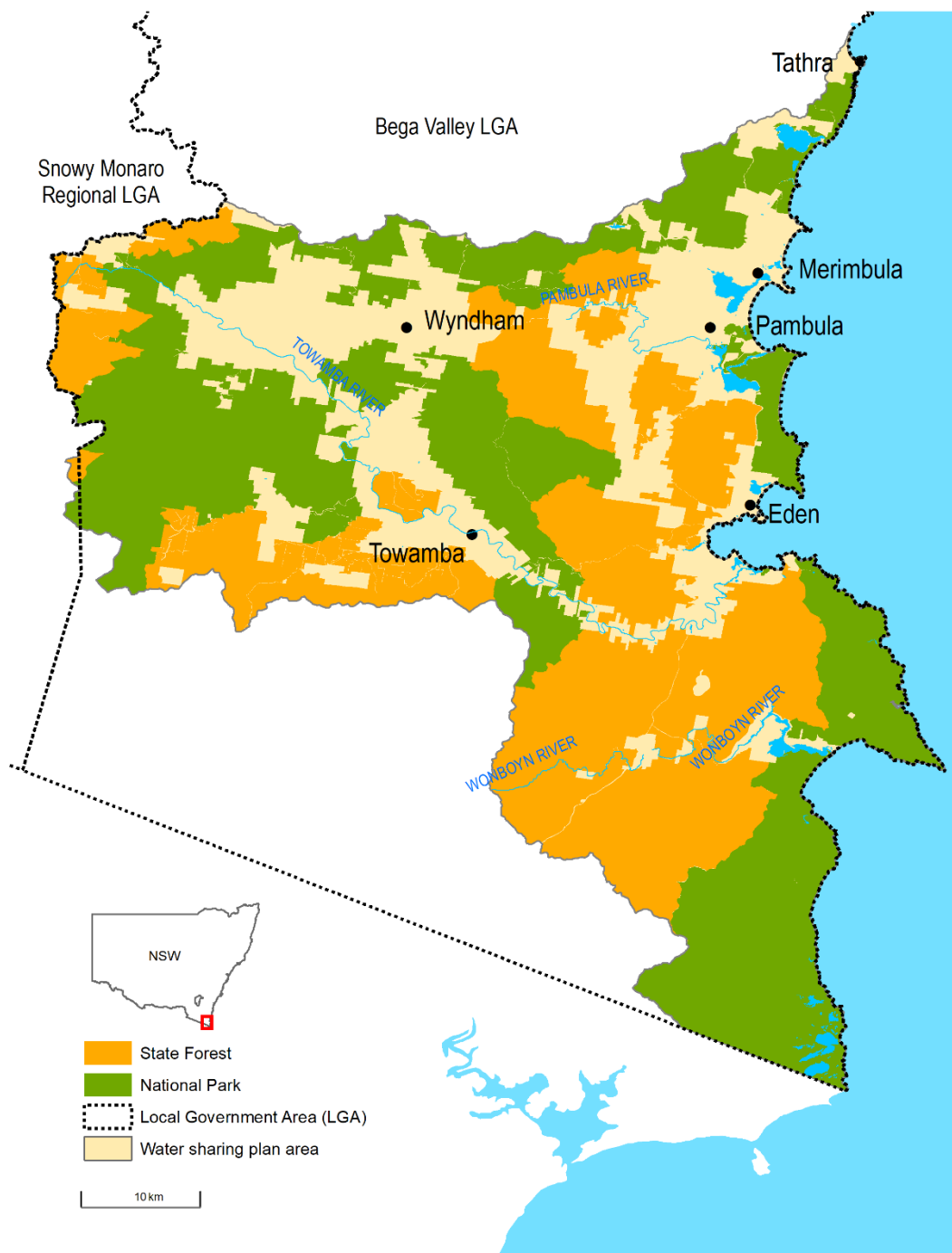


Figure 5: Map showing the Towamba Plan area, including LGAs and national parks<sup>40</sup>

across submissions received by the Commission. The submissions highlighting feedback on water sharing arrangements within the Towamba Plan are available on the Commission's website at the following link: <https://www.nrc.nsw.gov.au/2019-2020-wsp-reviews>

<sup>40</sup> Map developed by the Commission from publicly available NSW and Australian government data.

## 2.4 Water storages and town water supply systems

There are four water supply systems in the Bega Valley Shire (Table 5). The local water utility for the plan areas is Bega Valley Shire Council. Over half of the town water supply is sourced from groundwater (largely the Bega Borefield in the Mid Bega River Sands Water Source). Figure 6 shows the water resources and infrastructure in the Bega Valley Shire.

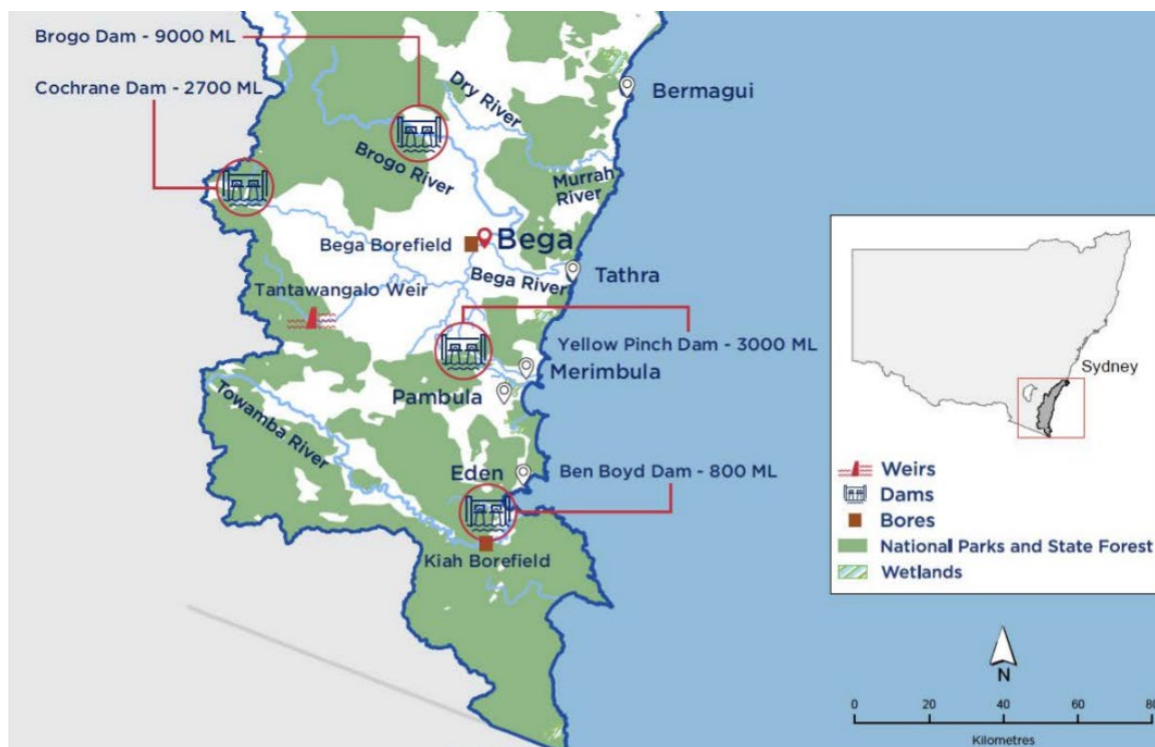


Figure 6: Water resources and infrastructure in the Bega Valley Shire<sup>41</sup>

Major water storages include:

- **Brogo Dam on the Brogo River** – an on-river storage managed by WaterNSW in the Bega Brogo Plan area, with a capacity 8,900 ML. Brogo Dam is located in the Upper Brogo River water source and covers a catchment area of 400km<sup>2</sup>. While the dam is not the dedicated storage for the Brogo-Bermagui water supply system, it acts as the main source of water for Quaama, Cobargo, Bermagui, Wallaga Lake and Akolele.<sup>42</sup> Water for the supply system is via an offtake four kilometres downstream of the dam. Releases are made for irrigation, town water supply, domestic and stock needs, and the environment.
- **Cochrane Dam on the Bemboka River** – a 2,700 ML dam privately owned by Cochrane Dam Pty Ltd (a subsidiary of Hydro Power Pty Ltd) in the Bega and Brogo Plan area. Its primary purpose is hydropower generation and secondary purpose is for irrigators downstream and the intake for Bemboka’s town water supply.

Off-river storages for town water supply include:

- **Yellow Pinch Dam** – a 3,000 ML off-stream storage located in the upper reaches of Merimbula Creek (in the Towamba Plan area). Tantawanglo Creek is the main source of

<sup>41</sup> Portion of map taken from DPIE (2020) *Draft Regional Water Strategy – South Coast*. Available at: [https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0020/329015/draft-rws-sc-strategy.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0020/329015/draft-rws-sc-strategy.pdf).

<sup>42</sup> Bega Valley Shire Council (n.d.). Brogo-Bermagui water supply system. Available at: [https://begavalley.nsw.gov.au/cp\\_themes/default/page.asp?p=DOC-VTI-86-71-42](https://begavalley.nsw.gov.au/cp_themes/default/page.asp?p=DOC-VTI-86-71-42)

water for Yellow Pinch Dam. The dam is also filled via the Bega River (in the Bega-Brogo Plan area) during moderate to high flows via the Bega to Yellow Pinch Dam pipeline.<sup>43</sup> Rainfall in the dam catchment is a minor source of water for the dam. .

- **Ben Boyd Dam** – an 800 ML off-stream storage that is used to supplement supply from the Kiah borefield. Kiah borefield usually fills the Eden Reservoir; however, Ben Boyd Dam is used as a supplementary storage when required. The Kiah borefield is the main source of water for Ben Boyd Dam when this is being filled and forms part of the Tantawanglo/Kiah water supply system.<sup>44</sup>
- **Tilba Dam** – a 90 ML off-river storage that stores water from Couria Creek in the Murrumbidgee Plan area. It is part of the Brogo-Bermagui supply system but has rarely been used in the plan period. However, there has been increased reliance on Tilba Dam over the past year post fires.

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<sup>43</sup> Bega Valley Shire Council (n.d.). Tantawanglo-Kiah water supply system. Available at: [https://begavalley.nsw.gov.au/cp\\_themes/default/page.asp?p=DOC-JWJ-52-46-17](https://begavalley.nsw.gov.au/cp_themes/default/page.asp?p=DOC-JWJ-52-46-17)

<sup>44</sup> DPIE (2020) *Draft Regional Water Strategy – South Coast*. Available at: [https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0020/329015/draft-rws-sc-strategy.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0020/329015/draft-rws-sc-strategy.pdf).

**Table 5: Water supply systems in the plan areas**

Water supply system	Towns serviced	Water sources	Storages	Plan area	Share component (ML/year) <sup>45</sup>
<b>Tantawanglo/Kiah</b>	Candelo, Wolumla, Tura Beach, Merimbula, Pambula Beach, South Pambula, Eden and Boydtown	Tantawangalo Creek Water Source	Yellow Pinch Dam	Bega – Brogo	1,500
		Bega River(via the Yellow Pinch Dam pipeline)			
		Lower Towamba River Water Source (Kiah Borefield)	Ben Boyd Dam	Towamba	1,400
<b>Bega/Tathra</b>	Bega, North Bega, Tarraganda, Kalaru, Tathra, Tathra River Estate and Mogareeka	Mid Bega River Sands Water Source (Bega borefield)	None	Bega – Brogo	2,640
<b>Brogo-Bermagui</b>	Quaama, Cobargo, Bermagui, Wallaga Lake, Akolele	Upper Brogo River Water Source	Brogo Dam	Bega- Brogo	700
		Narira Creek Water Source (Illawambra Creek weir)	Tilba Dam	Murrah Wallaga	50
		Wallaga Lake Tributaries Water Source (Couria Creek)			
<b>Bemboka</b>	Bemboka	Upper Bega/Bemboka Rivers Water Source	Cochrane Dam <sup>46</sup>	Bega- Brogo <sup>47</sup>	66

## 2.5 Environmental context

The Plans form part of the South East Corner Bioregion.<sup>48</sup> Major catchments in the region begin in largely forested uplands and escarpments, flowing to the coast through a series of estuaries and Intermittently Closed and Open Lakes and Lagoons (ICOLLs).<sup>49</sup> Native vegetation ranges from high-elevation woodlands, wet and damp sclerophyll forests, heaths, wetlands and

<sup>45</sup> Entitlement as listed in the Bega Brogo, Murrah-Wallaga and Towamba water sharing plans.

<sup>46</sup> Cochrane Dam is not a dedicated water storage for the Bemboka water supply system but controls water releases to the Bemboka River during drought

<sup>47</sup> Clause 24 of the Bega-Brogo Plan.

<sup>48</sup> DPIE (2016) *South East Corner Bioregion*. Available at: <https://www.environment.nsw.gov.au/bioregions/SouthEastCornerBioregion.htm>.

<sup>49</sup> DPIE (2020) *Draft Regional Water Strategy – South Coast*. Available at: [https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0020/329015/draft-rws-sc-strategy.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0020/329015/draft-rws-sc-strategy.pdf).

rainforests, to dry grass forests, coastal sclerophyll forests, grassy woodlands, dune scrub, floodplain and estuarine communities.<sup>50</sup>

The region has a relatively high proportion of land in protected areas (42 percent).<sup>51</sup> A significant proportion of the Bega Valley Shire is covered by public land, with 70 percent in reserves, state forest or other Crown land.<sup>52</sup> Cleared areas are focussed on coastal plains, primarily for towns and agriculture.<sup>53</sup> The region supports a high diversity of native fauna and flora, including the largest area of coastal wilderness in NSW.<sup>54</sup> The Plan areas include eight endangered ecological communities within the coastal zone.<sup>55</sup> The south coast plan area overlays 122 State Environmental Planning Policy (SEPP) wetlands, covering over 2,700 hectares<sup>56</sup>. Wallaga Lake in the northern section of the Murrumbidgee-Wallaga Plan area forms part of the Batemans Bay Marine Park.

The South Coast has twice the number of estuaries per kilometre compared with the north and central coast regions of NSW,<sup>57</sup> The Plans themselves include 29 estuaries, with 470 kilometres of estuarine foreshore. Of these, 22 are ICOLLs. Most estuaries are found in the Murrumbidgee-Wallaga and Towamba plan areas, with Bega River the only estuary within the Bega Brogo Plan area. A full list of the estuaries of the south coast plan area is provided in **Appendix C**.

Within the Bega Brogo Plan area, with over 50% vegetation clearance in most subcatchments.<sup>58</sup> The majority of the remaining vegetation is concentrated in the escarpment and upland areas, reflecting the location of National Parks (**Figure 3**). The Bemboka-Bega area consists of wet forest, pockets of rainforest and tall open forests, while the Brogo area are dominated by shrub forest and scrub with pockets of dry forest in the upland area.<sup>59</sup>

The Murrumbidgee-Wallaga and Towamba Plans were assessed at Plan commencement as having extraction sensitive ecological communities and extraction sensitive threatened species (see **Appendix D**).<sup>60</sup> Mapping of instream values is in the process of being updated by DPIE-Water,

<sup>50</sup> Department of Environment, Climate Change and Water (2010) *South Coast Regional Conservation Plan*. Available at: <https://www.planning.nsw.gov.au/-/media/Files/DPE/Plans-and-policies/south-coast-regional-conservation-plan-2010-12.pdf?la=en>.

<sup>51</sup> DPIE (2020) *Draft Regional Water Strategy – South Coast*. Available at: [https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0020/329015/draft-rws-sc-strategy.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0020/329015/draft-rws-sc-strategy.pdf).

<sup>52</sup> .id Demographic Resources (2020) *Community profile for Bega Valley*. Available at: <https://atlas.id.com.au/bega-valley>.

<sup>53</sup> DPIE (2020) *Draft Regional Water Strategy – South Coast*. Available at: [https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0020/329015/draft-rws-sc-strategy.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0020/329015/draft-rws-sc-strategy.pdf).

<sup>54</sup> Department of Environment, Climate Change and Water (2010) *South Coast Regional Conservation Plan*. Available at: <https://www.planning.nsw.gov.au/-/media/Files/DPE/Plans-and-policies/south-coast-regional-conservation-plan-2010-12.pdf?la=en>.

<sup>55</sup> Bega Valley Shire Council (2016) *State of the Environment 2012-2016*. Available at: [https://begavalley.nsw.gov.au/cp\\_themes/default/page.asp?p=DOC-AYR-78-62-44](https://begavalley.nsw.gov.au/cp_themes/default/page.asp?p=DOC-AYR-78-62-44).

<sup>56</sup> *Ibid*

<sup>57</sup> Scanes, P (2018) *NSW Estuary water quality trigger values – How new water quality trigger values for estuaries in NSW were derived*, prepared for OEH.

<sup>58</sup> Fryirs, K. and Brierley, G. (2005). Practical application of the river styles® framework as a tool for catchment-wide river management: a case study from Bega catchment, New South Wales. Available at: <https://riverstyles.com/wp-content/uploads/2019/05/Bega-ch-4.pdf>

<sup>59</sup> Fryirs, K. and Brierley, G. (2005). Practical application of the river styles® framework as a tool for catchment-wide river management: a case study from Bega catchment, New South Wales. Available at: <https://riverstyles.com/wp-content/uploads/2019/05/Bega-ch-4.pdf>

<sup>60</sup> Office of Water (2011) *Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources – Background document*. Available at: [http://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0006/547287/wsp\\_bega\\_background.pdf](http://www.water.nsw.gov.au/__data/assets/pdf_file/0006/547287/wsp_bega_background.pdf); NSW Office of Water (2010) *Water Sharing Plan for the Murrumbidgee-Wallaga Area Unregulated and Alluvial Water Sources – Background document*. Available at:

this will update water sources instream value classifications across the south coast plan area. 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). To date HEVAE mapping is complete for the Towamba Plan area, with mapping still in progress for the Bega Brogo and Murrah-Wallaga Plan areas.<sup>61</sup>

All third order and higher streams and rivers in the South Coast are classified as key fish habitat, including for the Australian grayling (*Prototroctes maraena*), which is listed as endangered under the *Fisheries Management Act 1994*.<sup>62</sup>

Water quality in the South Coast region varies based on many factors, internal and external to the Plans. Primary factors impacting on water quality in the region include stream-bed aggradation, changes to streamflows, degradation of instream habitat and riparian vegetation, poor land management, barriers to fish passage and introduced fish species.<sup>63</sup>

Brogo Dam has also altered stream flows along the Brogo and lower Bega rivers, redistributing flows between seasons, reducing the frequency of mid-range flows and lowering downstream water quality when dam levels are low. Other unregulated streams in the South Coast region have been historically modified by small weirs, impacting connectivity, riparian and aquatic environmental health and native fish spawning and feeding. Several of these weirs have been removed or modified to improve fish passage.<sup>64</sup>

## 2.6 Climate

The South Coast region has a temperate climate, characterised by warm summers and no dry season.<sup>65</sup> In the lower part of the South Coast region, where the Plans are located, average annual rainfall is between 1,000 and 1,200 millimetres, except for the Bega Valley, which experiences lower average rainfall (between 800 and 1,000 millimetres).<sup>66</sup>

Significant rainfall can occur at any time of the year, although late summer and early autumn are generally wetter. Flooding events are driven largely by east coast lows, which can occur at any time.<sup>67</sup> Between years, rainfall in the South Coast regions is highly variable, with the wettest 10 percent of years receiving more than 1,200 millimetres, compared to less than 580 millimetres in the driest 10 percent of years.<sup>68</sup>

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[https://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0011/547904/wsp\\_murrah\\_wallaga\\_background.pdf](https://www.water.nsw.gov.au/__data/assets/pdf_file/0011/547904/wsp_murrah_wallaga_background.pdf); Office of Water (2011) *Water Sharing Plan for the Towamba River Unregulated and Alluvial Water Sources – Background document*. Available at:

[http://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0009/549198/wsp\\_towamba\\_river\\_background.pdf](http://www.water.nsw.gov.au/__data/assets/pdf_file/0009/549198/wsp_towamba_river_background.pdf).  
61 It will be necessary for HEVAE criteria to consider the instream values and catchment values of ICOLLs and where relevant assets within the Batemans Marine Park that overlaps the southern section of Wallaga Lake in the Murrah-Wallaga Plan area.

62 DPIE (2020) *Draft Regional Water Strategy – South Coast*. Available at:  
[https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0020/329015/draft-rws-sc-strategy.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0020/329015/draft-rws-sc-strategy.pdf).

63 *Ibid*

64 *Ibid*

65 DPIE (2016) *South East Corner – climate*. Available at:  
<https://www.environment.nsw.gov.au/bioregions/SouthEastCorner-Climate.htm>.

66 DPIE (2020) *Draft Regional Water Strategy – South Coast*. Available at:  
[https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0020/329015/draft-rws-sc-strategy.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0020/329015/draft-rws-sc-strategy.pdf).

67 *Ibid*

68 *Ibid*

While the region generally receives enough rainfall, it does experience extreme drought. Major droughts on record (last 130 years) include the Federation Drought (1885-1903), World War II Drought (1939-1945) and the Millennium Drought (1997-2009). The most recent drought saw 2018 and 2019 record the second lowest two-year rainfall total on record.

New datasets and climate modelling undertaken to inform the *Draft South Coast Regional Water Strategy*<sup>69</sup> indicates that the South Coast region is likely to experience:

- changes in rainfall patterns – short term shifts (2020 – 2039) to decreased rainfall in late summer and autumn and increased winter rainfall
- elevated temperatures – maximum temperatures expected to increase by 0.5–1.0 degrees Celsius by 2030, and by 1.8–2.5 degrees Celsius by 2070, and minimum temperatures are expected to increase by 0.4–0.7 degrees Celsius by 2030
- increased evapotranspiration – increasing between 3-6 percent by 2070 associated with rising temperatures
- rising mean sea level – rising between 0.09-0.19 metres by 2030, with increased flooding and inundation in low-lying areas
- changes to extreme events, including more severe or longer-term drought, more severe storms, and increased height of sea-level events<sup>70</sup>
- the 95<sup>th</sup> percentile flow will decrease in magnitude by approximately 30 percent across the regulated and unregulated rivers, with a 23-31 percent increase in the number of cease to flow events in the Bega unregulated system.<sup>71</sup>

The *Draft South Coast Regional Water Strategy* also undertook an analysis of the impact of potential climate change on dam operations, finding that overall, Brogo Dam is likely to remain a reliable water supply:

- dam levels should remain above 50 percent for 97 percent of the time
- under median conditions, while 24-month inflows to Brogo Dam could decrease by 9 percent, from 161,000 ML to 146,000 ML, flows would be large enough that Brogo Dam would not be drawn down to critically low levels
- there is a slightly increased chance of Brogo Dam being drawn down to critically low levels, but the likelihood of this happening is small
- longer droughts are possible under the longer term ‘current climate’ modelling and the strategy’s climate change scenarios.<sup>72</sup>

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<sup>69</sup> The Draft Regional Water Strategy – South Coast has determined likely climate change impact scenarios based on a stochastic (modelled) dataset developed using observational rainfall and evaporation records. Stochastic modelling (using statistical methods to extend the data) results in a dataset covering up to 10,000 years. NARClm has been used to refine broad scale global climate change models to a more regional scale, that can be used to adjust the stochastic data set for climate change impacts. See DPIE (2020) Regional Water Strategies Guide, Chapter 3 and Attachment 2. Available at:

[https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0006/308994/rws-guide.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0006/308994/rws-guide.pdf)

<sup>70</sup> DPIE (2020) *Draft Regional Water Strategy – South Coast*. Available at:

[https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0020/329015/draft-rws-sc-strategy.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0020/329015/draft-rws-sc-strategy.pdf).

<sup>71</sup> *Ibid*

<sup>72</sup> DPIE (2020) *Draft Regional Water Strategy – South Coast*. Available at:

[https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0020/329015/draft-rws-sc-strategy.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0020/329015/draft-rws-sc-strategy.pdf).

## 2.7 Aboriginal context

The Traditional Owners of the area are the Yuin and Monaro Nations. More specifically, the Bega Shire lies within the southern Yuin region known as Guyangal, occupied by the Katungal, who are coastal fishing people (from the word 'Katung' which means sea).<sup>73</sup>

The entire landscape is imbued with a spirituality, which is intertwined with the Yuin as custodians of the lands and waters for which they have ongoing responsibilities to care for. There are numerous recorded and unrecorded cultural sites throughout the area that demonstrate thousands of years of custodianship (see further discussion in **Section 7**).

Parts of the area, particularly state forests and national parks are part of Aboriginal Areas, Aboriginal Land Agreements and an Indigenous Land Use Agreement (ILUA),<sup>74</sup> and managed jointly by Aboriginal boards of management through Memorandums of Understanding (MOUs).<sup>75</sup> Bundian Way is an example of an ongoing partnership led by Eden LALC with volunteers, groups and agencies.<sup>76</sup> The project aims to reinstate a 365-kilometre ancient pathway for Aboriginal people from Yuin, Ngarigo, Jaitmathang, Bidawal Country, which provided safe passage between the coast (Turemulerrer, or Twofold Bay) and the high country (Targangal, or Mount Kosciuszko). In 2013, the NSW Government officially recognised the Bundian Way's shared cultural, historical and wilderness significance with a heritage listing.<sup>77</sup>

Across the Bega Shire, 0.6 percent is Aboriginal freehold granted under the *Aboriginal Land Rights Act 1983*.<sup>78</sup> The area is also covered by a large native title claim for the South Coast People.<sup>79</sup> The claim comprises about 14,000 square kilometres (see **Figure 7**), from Bundeena in the north to south of Eden, west towards Braidwood and 3 nautical miles into the ocean. The claim includes areas of national park, State forests, council land and Crown land.<sup>80</sup> If successful, the claim will grant traditional fishing rights over a 17,000-square kilometre area of the coast,

<sup>73</sup> Egloff, B., Peterson, N. and Wesson, S. (2001) Biamanga National Park and Gulaga National Aboriginal Owners Research Report, Report to the Office of the Registrar, Aboriginal Land Rights Act 1983 (AIATSIS). In Bega Valley Shire Council (2010) *Stage Three A: Aboriginal Cultural Heritage Study*, prepared alongside NSW National Parks and Wildlife Service, The Aboriginal People of the Monaro. Available at: [https://begavalley.nsw.gov.au/cp\\_themes/default/page.asp?p=DOC-LBU-53-36-18](https://begavalley.nsw.gov.au/cp_themes/default/page.asp?p=DOC-LBU-53-36-18).

<sup>74</sup> There is one ILUA in the area – NI2001/003 - Twofold Bay, see: <http://www.nntt.gov.au/searchRegApps/NativeTitleRegisters/Pages/Search-Register-of-Indigenous-Land-Use-Agreements.aspx>.

<sup>75</sup> Biamanga and Gulaga National Park Aboriginal Ownership and Leaseback Agreements between the Yuin people and the Office of Environment and Heritage (2006); The Southern Snowy Mountains Aboriginal Community Memorandum of Understanding between the National Parks and Wildlife Service, Office of Environment and Heritage and the Southern Snowy Mountains Aboriginal Community (2019). See: <https://www.environment.nsw.gov.au/research-and-publications/publications-search/biamanga-and-gulaga-national-park-aboriginal-ownership-and-leaseback-agreements>.

<sup>76</sup> Agencies include: National Parks & Wildlife Service, Forestry Corporation of NSW, Bega Valley Shire Council, Snowy Monaro Regional Council, Aboriginal Affairs NSW, South East Local Land Services.

<sup>77</sup> The Bundian Way is currently in development to become a connected walking track however is not open fully for walkers yet. There are parts that are open and experiences include the Whale Dreaming Trail and Story Trail in Eden and the Bundian Way Art Gallery in Delegate, which are presented by Eden LALC (see <https://bundianway.com.au/>).

<sup>78</sup> Bega Valley Shire Council (2010) *Stage Three A: Aboriginal Cultural Heritage Study*, prepared alongside NSW National Parks and Wildlife Service, The Aboriginal People of the Monaro. Available at: [https://begavalley.nsw.gov.au/cp\\_themes/default/page.asp?p=DOC-LBU-53-36-18](https://begavalley.nsw.gov.au/cp_themes/default/page.asp?p=DOC-LBU-53-36-18).

<sup>79</sup> NC2017/003 – filed in 2017, entered on register 2018, and represented by NTSCORP (see: [www.nntt.gov.au/searchRegApps/NativeTitleRegisters/Pages/RNTC\\_details.aspx?NNTT\\_Fileno=NC2017/003](http://www.nntt.gov.au/searchRegApps/NativeTitleRegisters/Pages/RNTC_details.aspx?NNTT_Fileno=NC2017/003)).

<sup>80</sup> Gorton, S. (2018) 'Historic South Coast Native Title claim heads to Federal Court', *South Coast Register*, February 16. Available at: [www.southcoastregister.com.au/story/5233548/historic-south-coast-native-title-claim-heads-to-federal-court/](http://www.southcoastregister.com.au/story/5233548/historic-south-coast-native-title-claim-heads-to-federal-court/).



which is vital to Yuin culture (see also **Section 8**).<sup>81</sup> The Yuin have a deep association with the water, which is a key part of the claim, as explained by Yuin man Wally Stewart:

*'It's not only about the land, it's about the water as well. A lot of our mob say the land is our cupboard, the water is our refrigerator. Probably 75 per cent of our food source came from the ocean and the estuaries, and we've got strong evidence down here of that for the last 21,000 years. We survived off our water'*<sup>82</sup>

The successful native title registration demonstrates sufficient evidence for the claim to go before the court for determination and requires government departments to consult with the claimants on any development or land use projects and allows claimants a greater say in management of land and waters. Shoalhaven City Council will apply to join proceedings on the South Coast Native Title claim in the Federal Court.<sup>83</sup>

There are strong and vibrant Aboriginal communities across the south coast, with many respected Elders who are significant leaders of their communities.<sup>84</sup> There are three LALCs in the Plan areas – Merrimans, Bega and Eden (see **Figure 7**). The Bega Valley Shire Council works in partnership with these LALCs and the native title claimants of the Shire through an MOU.<sup>85</sup>

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<sup>81</sup> Liddle, R. (2018) 'South Coast Native Title case won't harm locals or business', *SBS news*, February 23. Available at: [www.sbs.com.au/nitv/article/2018/02/23/south-coast-native-title-claim-wont-come-cost-says-traditional-owner](http://www.sbs.com.au/nitv/article/2018/02/23/south-coast-native-title-claim-wont-come-cost-says-traditional-owner).

<sup>82</sup> Coote, G. (2018) 'Traditional owners Yuin fight for cultural fishing rights with NSW native title claim', *ABC Illawarra*, February 20. Available at: [www.abc.net.au/news/2018-02-20/traditional-owners-on-nsw-south-coast-fight-for-native-title/9461692](http://www.abc.net.au/news/2018-02-20/traditional-owners-on-nsw-south-coast-fight-for-native-title/9461692).

<sup>83</sup> Fist, R. (2018) 'Shoalhaven Council part of historic Native Title claim', *Kiama Independent*, August 7. Available at: [www.kiamaindependent.com.au/story/5570689/shoalhaven-council-part-of-historic-native-title-claim/](http://www.kiamaindependent.com.au/story/5570689/shoalhaven-council-part-of-historic-native-title-claim/).

<sup>84</sup> Bega Valley Shire Council (2010) *Social Issues Paper: Aboriginal People*. Available at: [https://begavalley.nsw.gov.au/cp\\_themes/default/page.asp?p=DOC-GBM-41-35-06](https://begavalley.nsw.gov.au/cp_themes/default/page.asp?p=DOC-GBM-41-35-06).

<sup>85</sup> MOU between Bega, Eden and Merrimans Local Aboriginal Land Councils, adopted 7 August 2019. Available at: [https://begavalley.nsw.gov.au/cp\\_themes/default/page.asp?p=DOC-LBU-53-36-18](https://begavalley.nsw.gov.au/cp_themes/default/page.asp?p=DOC-LBU-53-36-18).

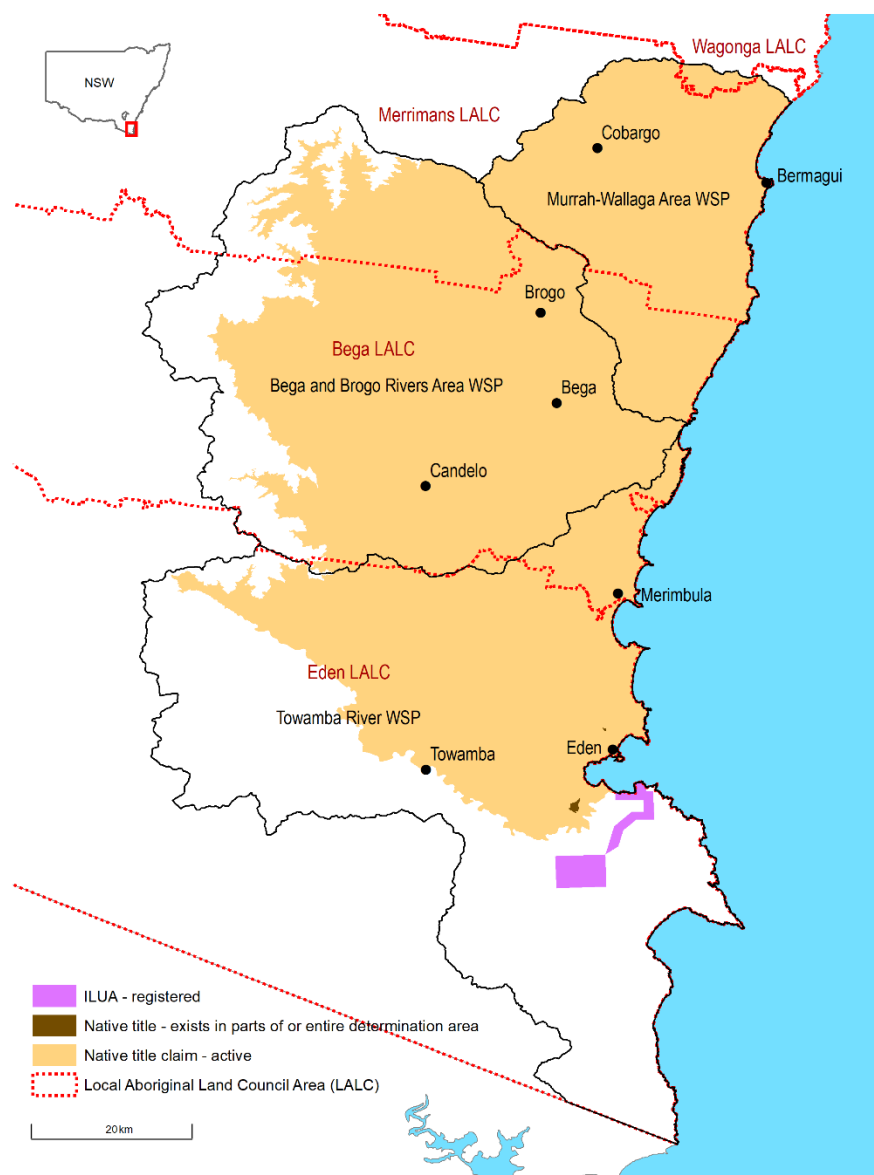


Figure 7: LALC and native title claim areas and determination areas for the plan areas<sup>86</sup>

## 2.8 Socio-demographic context

The Plan areas largely sit within the Bega Valley Shire Local Government Area (LGA), which covers 6,280 square kilometres, with only a small area in the Eurobodalla LGA (see **Figure 3**, **Figure 4** and **Figure 5**).<sup>87</sup> For this reason, key socio-demographic trends described below will focus on the Bega Valley Shire. **Table 6** provides a snapshot of the population, density and growth in the Bega Valley LGA.

Overall, growth in population and housing development in the Bega Valley Shire LGA has been steady and moderate over the period of the Plans, with this trend expected to continue. The population growth experienced since the plans commenced in 2011 has been low relative to the

<sup>86</sup> Map developed by the Commission using LALC data provided by DPI and native title areas from the National Native Title Tribunal website.

<sup>87</sup> .id Demographic Resources (2020) *Community profile for Bega Valley*. Available at: <https://atlas.id.com.au/bega-valley>.

regional NSW average. Significant population growth is not expected in the future, with population forecasts for Bega Valley Shire between 2016 and 2036 well below Regional NSW averages (12.36 percent compared to Regional NSW average of 22 percent) between 2016 and 2036).<sup>88</sup>

Population density for the Bega Valley Shire overall sits around the regional NSW average. In this area, the highest population densities in 2016 were found in the main centres of Merimbula-Millingandi and Bega (0.93 and 0.91 persons per hectare, respectively).<sup>89</sup>

Based on forecasts, there are unlikely to be significant increases in dwellings or household numbers in the region.<sup>90</sup> The region should continue to have a housing market primarily catering for families (in Bega) and retirees (in coastal towns), predominantly in separate house dwellings (with rates of medium-high density housing below the Regional NSW average).<sup>91</sup> Overall, residential development is projected to remain steady with marginal growth compared to Regional NSW averages.<sup>92</sup> The greatest increase in new dwellings in the Bega Valley Shire is expected to occur in the Tura-Mirador, Bermagui Coast and Bega districts.<sup>93</sup>

**Table 6: Population snapshot<sup>94</sup>**

	Estimated Resident Population 2019 (no.)	Population density (persons per hectare)	Average annual population growth 2011-19 (%)	Forecast population change 2016-36 (%)
Bega Valley Shire	34,476	0.05	0.58	12.36
<b>Regional NSW</b>	<b>2,777,654</b>	<b>0.04</b>	<b>0.82</b>	<b>22.3</b>

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

## 2.9 Economic context

Bega Valley Shire is predominantly rural, with a main urban centre in Bega, other key townships, villages and holiday areas.

Conservation and timber production are the primary land uses (national park and state forest). The next biggest land use is agriculture, particularly dairy farming, with fishing, oyster harvesting, tourism and retail also important industries.<sup>95</sup>

**Table 7** lists the ten largest industries by value added<sup>96</sup> across the Bega Valley Shire (out of 19 industry categories). As with socio-demographic trends (**Section 2.8**), this section focuses on economic trends in the Bega Valley Shire LGA, as it comprises most of the plan area.

<sup>88</sup> .id Demographic Resources (2020) *Community profile for Bega Valley*. Available at: <https://atlas.id.com.au/bega-valley>.

<sup>89</sup> *Ibid*

<sup>90</sup> .id Demographic Resources (2021) *Bega Valley Population*. Available at: <https://forecast.id.com.au/bega-valley/population>.

<sup>91</sup> *Ibid*

<sup>92</sup> .id Demographic Resources (2021) *Bega Valley Development*. Available at: <https://forecast.id.com.au/bega-valley/dwellings-development-map>.

<sup>93</sup> *Ibid*

<sup>94</sup> .id Demographic Resources (2021) *Community profile for Bega Valley*. Available at: <https://profile.id.com.au/>.

<sup>95</sup> *Ibid*

<sup>96</sup> 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

Bega Valley Shire's Gross Regional Product is estimated at just under \$1.5 billion, representing 0.25 percent of NSW's Gross State Product.

Health care and social assistance is of the highest value to the regional economy and has grown over the past ten years.<sup>97</sup> Bega Valley Shire has a larger percentage of value added from health care and social assistance than the NSW industry average, likely reflecting the movement of retirees to the area.<sup>98</sup> It is also the largest employer in the region, almost tripling the number of employees between 2013-14 and 2018-19.<sup>99</sup>

Agriculture, forestry and fishing, and construction are also significant contributors to the economy, although construction has declined.<sup>100</sup> The percentage contribution of agriculture, forestry and fishing has remained steady and is significantly higher than the average contribution across NSW.<sup>101</sup> It is the fifth highest employer in the region, growing just under 140 percent since 2013-14.<sup>102</sup>

Agriculture, forestry and fishing and accommodation are key water reliant industries and of value to the economy in the region. Water quality and protection of environmental assets are likely to underpin the profitability of accommodation and retail industries, as they rely heavily on tourism.

**Table 7: Top ten industries by value added in the Bega Valley Shire<sup>103</sup>**

Top ten industries	\$ million	% of total (BVS)	% of total (NSW)	% change 2013/14 - 2018/19 (BVS)
Health Care and Social Assistance	147.1	12.6	7.6	26.8
Agriculture, Forestry and Fishing	127.6	11	2	0.1
Construction	128.4	11	8.9	-12.1
Manufacturing	121.6	10.5	6.1	-4.4
Accommodation and Food Services	78.7	6.8	3.1	6.7
Retail Trade	77.6	6.7	5.1	-10.4
Education and Training	70.9	6.1	5.3	1.8
Public Administration and Safety	61.9	5.3	5.4	7.5
Professional, Scientific and Technical Services	44	3.8	9.9	-1.3
Rental, Hiring and Real Estate Services	41.9	3.6	4.6	5.5

sector than output (total gross revenue), as some industries have high levels of output but require large amounts of input expenditure to achieve that (.id Demographic Resources (2019) *Economic value - value added*. Available at: <https://economy.id.com.au/value-add-by-industry>).

<sup>97</sup> .id Demographic Resources (2021) *Value Add by Industry - Bega Valley*. Available at: <http://economy.id.com.au/bega-valley/value-add-by-industry>.

<sup>98</sup> *Ibid*

<sup>99</sup> *Ibid*

<sup>100</sup> *Ibid*

<sup>101</sup> *Ibid*

<sup>102</sup> *Ibid*

<sup>103</sup> *Ibid*

## 2.9.1 Industries dependent on water extraction

**Appendix B** identifies water sources with high economic dependence classifications in all plans. When the Bega Brogo Plan commenced, ten unregulated water sources were identified as having high economic significance due to the value of the commercial extraction to local communities. Dairy was the dominant agricultural industry, with the region also supporting beef cattle, horticulture, wool production and fat lambs.<sup>104</sup> One water source was classified as having high economic significance in the Murrah-Wallaga Plan area, with dairy and beef farming the dominant industries. No water sources in the Towamba Plan were considered to have high economic dependence on water extraction.

In the Bega Valley Shire, total agricultural production value in 2015-16 was just over \$96 million. Milk production held the largest value (just over 65 percent), followed by livestock slaughterings (just under 28 percent). Although significantly lower in value, the next largest industries were nurseries and cut flowers (just over 3 percent), crops for hay (just under 2 percent) and wool (1.5 percent).<sup>105</sup>

The average dairy herd size in 2019-20 for the southern region<sup>106</sup> was 463 with an average farm area of 419 hectares.<sup>107</sup> Debt per cow for the southern region which includes south coast dairy farms was higher than the state average at \$6,201 (NSW average of \$5,271) and feed imported was 4 percent higher than the state average.<sup>108</sup> Higher feed import numbers resulted from drought conditions that limited on site pasture production. Feedback obtained by the Commission indicated that many producers had to rely heavily on on-farm feed reserves to maintain adequate nutrition for their dairy herd.

Coastal feed base systems rely on natural rainfall, which is supplemented by irrigation in dry periods. However, extremes in weather have made it difficult for dairy farmers to manage the feed quality and quantity. Fodder prices in the Bega Valley have been historically high post drought and bushfires creating an additional challenge for local dairy farmers.<sup>109</sup> A further recent challenge raised by dairy farmers has been limited staffing options as a result of COVID restrictions that closed borders.<sup>110</sup> This has resulted in a significant constraint to milk production.

When the Bega Brogo Plan commenced, around one quarter of dairy farms in the Bega Valley were under irrigation.<sup>111</sup> Water for wash-down and stock watering for the dairy and beef industries is less than the volume used for irrigation but also important for the viability of

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<sup>104</sup> Office of Water (2011) *Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources – Background document*. Available at:

[http://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0006/547287/wsp\\_bega\\_background.pdf](http://www.water.nsw.gov.au/__data/assets/pdf_file/0006/547287/wsp_bega_background.pdf).

<sup>105</sup> id. Demographic Resources (2021) *Bega Valley Shire – Agriculture* (based on data from the Australian Bureau of Statistics). Available at: <https://economy.id.com.au/bega-valley/value-of-agriculture>.

<sup>106</sup> The southern region in the Dairy Farm Monitor project covers dairy farms along the coast from Sydney to Bega as well as farms in the inland regions of the Central West, Tamworth and the Riverina.

<sup>107</sup> Dairy Australia (2020) *Dairy Farm Monitor Project NSW Annual Report 2019/20* Available at: [https://www.dairyaustralia.com.au/dairynsw/resources-repository/2020/11/26/dairy-farm-monitor-project-nsw-annual-report-2019\\_20#.YGEyM2c8TIU](https://www.dairyaustralia.com.au/dairynsw/resources-repository/2020/11/26/dairy-farm-monitor-project-nsw-annual-report-2019_20#.YGEyM2c8TIU).

<sup>108</sup> *Ibid*

<sup>109</sup> Dairy Australia (2020) *Situation and Outlook Report December 2020* Available at: <https://www.dairyaustralia.com.au/resource-repository/2020/12/08/situation-and-outlook-report-december-2020#.YD1t92c8TIU>.

<sup>110</sup> *Ibid*

<sup>111</sup> Office of Water (2011) *Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources – Background document*. Available at:

[http://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0006/547287/wsp\\_bega\\_background.pdf](http://www.water.nsw.gov.au/__data/assets/pdf_file/0006/547287/wsp_bega_background.pdf)

farms.<sup>112</sup> Drought and bushfires have directly impacted the dairy industry, with high irrigation water and feed prices placing strain on farms.<sup>113</sup>

## 2.9.2 Industries dependent on water access and amenity value

Water in the region is also recognised for its non-extractive values such as fishing, tourism and amenity – one of the key reasons it is known as the ‘Sapphire Coast’. Access to high quality coastal and other waterways is critical to supporting the fishing, tourism and recreation industries. The NSW government has invested \$5,425,000 to upgrade coastal infrastructure in the Bega Valley as part of its coastal infrastructure and waterways funding.<sup>114</sup>

There are 1,200 tourism-related business in the South Coast region<sup>115</sup>, which directly employ just under 7 percent of the resident population. In addition, the high value accommodation and food services and retail trade industries also rely heavily on seasonal tourism and collectively make up nearly 25 percent of employment in the area.

Travel to the south coast for overnight stays is seasonal with the majority visiting in Summer (34 percent), Spring (27 percent) and Winter (25 percent) and Autumn had the lowest visitations at 14 percent. The South Coast marine strategy confirms there are strong levels of seasonality in visitation.<sup>116</sup> The South Coast is heavily dependent on the Sydney market, accounting for 51 percent of all visitors to the region. The Canberra region and Victorian market are more important as source markets to the region’s south.<sup>117</sup> The NSW cruise market is forecast to grow strongly over the next decade. The Port of Eden is established as a cruise port and is well positioned for continued growth. It attracted 14 cruise ships in 2017-18, with \$4.6 million total output.<sup>118</sup>

Aquatic and coastal activities are enjoyed by 91 percent of international visitors to the South Coast region as a whole.<sup>119</sup> Going to the beach (50 percent) and sightseeing (28 percent) were listed as priority activities for visitors to the broader South Coast region, indicating the high amenity value of water in the area.<sup>120</sup> Access to waterways for water-based activities, amenity

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<sup>112</sup> NSW Office of Water (2010) *Water Sharing Plan for the Murrumbidgee Area Unregulated and Alluvial Water Sources – Background document*. Available at: [https://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0011/547904/wsp\\_murrumbidgee\\_background.pdf](https://www.water.nsw.gov.au/__data/assets/pdf_file/0011/547904/wsp_murrumbidgee_background.pdf).

<sup>113</sup> Bega Cheese (2020) *Bega Cheese Limited Annual Report 2020* Available at: <https://www.begacheese.com.au/wp-content/uploads/2020/08/Bega-Cheese-Ltd-Annual-Report-2020-redopt.pdf>.

<sup>114</sup> NSW Government (2019) *South Coast Marine Tourism Strategy* Available at: <https://www.nsw.gov.au/regional-nsw/20-year-vision-for-nsw-south-coast-marine-tourism#:~:text=The%20NSW%20South%20Coast%20Marine%20Tourism%20Strategy%20outlines,yield%20through%20the%20delivery%20of%20its%20action%20plan.>

<sup>115</sup> The Destination NSW South Coast Region reaches from Wollongong to Eden so a larger area than Plans. See: Destination NSW (2021) *South Coast NSW Visitor Profile September 2020* Available at: <https://www.destinationnsw.com.au/wp-content/uploads/2021/02/south-coast-visitor-profile-ye-sep-2020.pdf>

<sup>116</sup> NSW Government (2019) *South Coast Marine Tourism Strategy* Available at: <https://www.nsw.gov.au/regional-nsw/20-year-vision-for-nsw-south-coast-marine-tourism#:~:text=The%20NSW%20South%20Coast%20Marine%20Tourism%20Strategy%20outlines,yield%20through%20the%20delivery%20of%20its%20action%20plan.>

<sup>117</sup> *Ibid*

<sup>118</sup> *Ibid*

<sup>119</sup> *Ibid*

<sup>120</sup> Destination NSW (2021) *Travel to South Coast Tourism Region – Year ended September 2020*. Available at: <https://www.destinationnsw.com.au/wp-content/uploads/2021/02/south-coast-time-series-ye-sep-2020.pdf>.

value and fresh produce are also central to the various tourism strategies developed for the South Coast region.<sup>121</sup>

South Coast estuaries, lakes and lagoons also support a growing aquaculture industry, mostly oyster farming, which underpin the region’s tourism industry. Protecting the water quality of coastal lakes and estuaries from stormwater, sewage overflows, and runoff from agricultural and forestry land is critical for these industries.<sup>122</sup>

The DPI Fisheries (2020) *Aquaculture Production Report 2018-2019* indicates there are four key estuaries that produce oysters in the South Coast Plan area (Table 8).<sup>123</sup> In 2018-19 these produced 1,162,016 Sydney Rock Oyster dozens to the value of \$10,222,356, making up 18.7 percent of the total Sydney and Pacific Rock Oyster production for 2018-19 (see **Table 8**). Their production has experienced steady growth increasing by 22.4 percent in 2018-19 since 2015-16.<sup>124</sup>

The NSW oyster industry has experienced a downturn in sales in 2020 and stock reduction in some areas due to Covid and bushfire impacts in areas like the South Coast.<sup>125</sup>

**Table 8: Sydney Rock Oyster & Pacific Oyster\* Production by Estuary for the South Coast Plan Areas 2018/2019<sup>126</sup>**

Estuary	Species	Total dozens	Value (\$)
Wapengo Lake	Sydney Rock Oyster	196,069	\$1,705,173
Merimbula Lake	Sydney Rock Oyster	569,030	\$5,040,794
Pambula River	Sydney Rock Oyster	264,766	\$2,379,374
Wonboyn River	Sydney Rock Oyster	122,216	\$1,097,015
<b>Total/ NSW % of total</b>		<b>1,152,081/18.3%</b>	<b>\$10,222,356/18.7 %</b>

<sup>121</sup> Sapphire Coast (2013) *South Coast NSW Destination Management Plan*. Available at: <https://www.sapphirecoast.com.au/wp-content/uploads/2013/06/South-Coast-Destination-Management-Plan-2013-2020.pdf>; Sapphire Coast (2011) *Sapphire Coast Heritage Tourism Strategy 2011-2015*. Available at: <https://www.sapphirecoast.com.au/wp-content/uploads/2013/06/Sapphire-Coast-Heritage-Tourism-Strategy-Final-Updated-9-June.pdf>.

<sup>122</sup> DPIE-Water (2020) *Draft Regional Water Strategy South Coast* Available at: <https://www.industry.nsw.gov.au/water/plans-programs/regional-water-strategies/public-exhibition/previous/south-coast>.

<sup>123</sup> DPI Fisheries (2020) *Aquaculture Production Report 2018-2019*. Available at: [https://www.dpi.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0008/1198925/Aquaculture-Production-Report-2018-2019.pdf](https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0008/1198925/Aquaculture-Production-Report-2018-2019.pdf)

<sup>124</sup> Note this excludes Warapego Lake Pacific Oysters due to confidentiality reasons. The Commission has extrapolated these figures from Table 4: Sydney Rock Oyster & Pacific Oyster\*\* Production by Estuary and Grade 2018-2019 and Table 5: Sydney Rock Oyster Production – 2015-16, 2016-17, 2017-18 & 2018-19 by Estuary and Grade of the DPI Fisheries (2020) *Aquaculture Production Report 2018-2019*

<sup>125</sup> Oysters Australia and FRDC (2020) *“Insights into the impacts of the Covid -19 pandemic on the Australian oyster Industry”* Powerpoint presentation provided by DPI Fisheries in December 2020 unpublished.

<sup>126</sup> DPI Fisheries (2020) *Aquaculture Production Report 2018-2019*. Available at: [https://www.dpi.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0008/1198925/Aquaculture-Production-Report-2018-2019.pdf](https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0008/1198925/Aquaculture-Production-Report-2018-2019.pdf)

## 2.10 Impact of 2019-20 bushfires

The plan areas were significantly affected by bushfires in 2019-20. It was evident from stakeholder interviews that the impacts of the bushfires are far reaching and long-lasting. DPIE's fire extent and severity mapping indicates that 54 percent (338,348 hectares) of the Bega Valley Shire LGA was impacted by the bushfires.<sup>127</sup> Around 79 percent (268,637 hectares) of the fireground within the Bega Valley Shire experienced a moderate to extreme severity burn.

The bushfires extensively impacted communities, with loss of life, ongoing physical and mental health impacts and financial hardship. More than 600 dwellings and 1000 other structures were damaged or destroyed.<sup>128</sup> Water infrastructure and water quality was also impacted, resulting in the issuing of boil water notices by Bega Valley Shire Council. Several farms in the Bega Valley Shire, including suppliers to Bega Cheese, were impacted through loss of pastures and fencing, and loss of power. In response, Bega Cheese established a crisis management team and engaged volunteers to provide farmers with generators, feed and farm repairs. However, there were cases where milk could not be cooled, with an estimated 900,000 litres of milk wastage on farm.<sup>129</sup>

Native forests were extensively impacted by the bushfires with large areas of State Forest burnt by crowning fires resulting in a high level of tree mortality.<sup>130</sup> Aquatic environments were also severely impacted by the fires, with a number of the catchments and waterways within the plan areas affected, particularly following post-fire rainfall events that occurred soon after the fires. These rainfall events washed ash, sediment and contaminants into waterways and estuaries, resulting in a number of water quality issues. While no major mortality events were documented in the Plan areas, other coastal waterways did experience significant post-fire aquatic fauna mortality, most notably, the Macleay River in northeast NSW.<sup>131</sup>

The predicted range of a number of threatened species, including the Australian grayling (*Prototroctes maraena*)<sup>132</sup> were impacted by the fires. A number of non-listed species were also identified as being impacted, for example, Claytons Spiney Crayfish. Such species are likely at risk given they may have declined as a result of bushfire impacts.

Predicted changes in the frequency and intensity of fires will no doubt place further pressure on aquatic ecosystems if they are exposed to successive natural disasters.<sup>133</sup> The resilience of these systems may be reduced over time meaning that further interventions will likely be required to support ecosystem health in the future. Water yield or streamflows may be impacted by fire in the short and long-term, with research indicating that the duration of impacts to streamflows is

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<sup>127</sup> Based on DPIE Fire Extent and Severity Mapping version 3. Available at:

<https://datasets.seed.nsw.gov.au/dataset/f7eb3f73-5831-4cc9-8259-8d1f210214ac/metaexport/html>

<sup>128</sup> Bega Valley Shire Council (2020) *Recovery Action Plan – 2019/2020 Black Summer Bushfires*. Available at: [https://begavalley.nsw.gov.au/cp\\_themes/default/page.asp?p=DOC-YJJ-57-32-13](https://begavalley.nsw.gov.au/cp_themes/default/page.asp?p=DOC-YJJ-57-32-13).

<sup>129</sup> Hogan, R. (2020) "Pretty scary stuff": Bega Cheese chairman recounts damage from bushfires', *Inside FMCG*, 17 January. Available at: <https://insidefmcg.com.au/2020/01/17/pretty-scary-stuff-bega-cheese-chairman-recounts-damage-from-bushfires/>.

<sup>130</sup> Interview: Forestry Corporation, 19 March 2021.

<sup>131</sup> Silva, L. M. G., Doyle, K., E. Duffy, D., Humphries, P., Horter, A., and Baumgartner, L. J. (2020) Mortality events resulting from Australia's catastrophic fires threaten aquatic biota. *Global Change Biology*. Letter to the editor.

<sup>132</sup> Listed as endangered under the NSW *Fisheries Management Act 1994* and vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

<sup>133</sup> Leigh, C., Bush, A., Harrison, E. T., Ho, S. S., Luke, L., Rolls, R. J., & Ledger, M. E. (2015). Ecological effects of extreme climatic events on riverine ecosystems: Insights from Australia. *Freshwater Biology*, 60(12), 2620–2638.



dependent on the fire sensitivity of the vegetation and the age of the impacted vegetation.<sup>134</sup> The broad overall trends indicate that there is a post fire initial increase in streamflow, followed by long-term reduction in water yield<sup>135</sup>. Research indicates that where the vegetation is dominated by fire resistant eucalypts and mature mixed tree species, the impact of fire on the water balance may not be significant and will return to pre-fire conditions within a few years.<sup>136</sup> As such, the level of impact on aquatic ecosystems following fire will vary according to vegetation cover across the south coast plan area.

There are several bushfire recovery programs in the region. The Department of Primary Industries (DPI) is managing the Rural Recovery Support Service, funded by Resilience NSW, which assists rural landholders and primary producers impacted by the recent bushfires. DPIE advised that as of the end of February 2021, there were 85 open cases and 100 closed cases in the Bega Valley.

Bega Valley Shire Council has developed a Recovery Action Plan and Bega Valley Local Recovery Committee to provide leadership for local recovery efforts. Bega Valley Shire, Shoalhaven and Eurobodalla councils are also developing a joint South Coast Catchment and Waterways Fire Recovery Plan.<sup>137</sup> This plan is intended to guide medium to long-term works to manage threats to environmental, cultural, social and economic values of catchments and waterways. NSW government agencies including the National Parks and Wildlife Service, Local Land Services, DPI-Fisheries, Marine Parks and the Forestry Corporation of NSW will help to provide a coordinated cross-tenure response.

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<sup>134</sup> Marcar NE, Benyon RG, Polglase PJ, Paul KI, Theiveyanathan S and Zhang L 2006. *Predicting the hydrological impacts of bushfire and climate change in forested catchments of the River Murray Uplands: A review*. CSIRO: Water for a Healthy Country National Research Flagship. Available at:

[https://www.ipcc.ch/apps/nj-lite/ar5wg2/nj-lite\\_download2.php?id=7726](https://www.ipcc.ch/apps/nj-lite/ar5wg2/nj-lite_download2.php?id=7726)

<sup>135</sup> Pugh, D. (2014) *How frosts regulated streamflows*. NEFA Background Paper. Available at:

[https://d3n8a8pro7vhmx.cloudfront.net/ncec/pages/50/attachments/original/1422089907/How\\_Forests\\_Regulate\\_Streamflows.pdf?1422089907](https://d3n8a8pro7vhmx.cloudfront.net/ncec/pages/50/attachments/original/1422089907/How_Forests_Regulate_Streamflows.pdf?1422089907)

<sup>136</sup> Marcar NE, Benyon RG, Polglase PJ, Paul KI, Theiveyanathan S and Zhang L 2006. *Predicting the hydrological impacts of bushfire and climate change in forested catchments of the River Murray Uplands: A review*. CSIRO: Water for a Healthy Country National Research Flagship. Available at:

[https://www.ipcc.ch/apps/nj-lite/ar5wg2/nj-lite\\_download2.php?id=7726](https://www.ipcc.ch/apps/nj-lite/ar5wg2/nj-lite_download2.php?id=7726); eWaterCRC (n.d.). *Impacts of Wildfire on Water Flows from Forested Catchments*. Available at:  
[https://ewater.org.au/bushfire/background\\_impactflows.shtml](https://ewater.org.au/bushfire/background_impactflows.shtml)

<sup>137</sup> DPIE-EES (2021) *NSW Wildlife and Conservation Bushfire Recovery: Medium-term response plan*. Available at:  
<https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Parks-reserves-and-protected-areas/Fire/nsw-wildlife-and-conservation-bushfire-recovery-medium-term-response-plan-200478.pdf>

## 3 Overall advice on extension and replacement

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

The Commission identified several examples of good practice and positive outcomes in this review. While recognising the strengths of the Plans, the Commission has identified several opportunities to improve outcomes that justify replacing the Plans, after an extension of two years to allow time to undertake required data collection and analysis. These opportunities are based on new information and the lessons learned from implementing the Plans, including:

- **Setting sustainable limits:** The Plans do not set clear, sustainable numeric LTAAELs. LTAAELs within the Plans include an estimate of Basic Landholder Rights (BLR), and unique to water sharing plans across NSW, include an estimate of harvestable rights. However, these estimates require verification. Experience in the recent drought has highlighted issues with the method for establishing AWDs for the regulated rivers in the Bega and Brogo Plan. AWDs have not been used to ensure compliance with LTAAELs in the unregulated and alluvial sources. Improved measures managing extraction during drought should also be investigated.<sup>138</sup>
- **Enhancing economic opportunities while reducing pressures on low flows:** The Plans should look to reduce pressure on low flows to ensure environmental outcomes and alleviate community tension. DPIE-Water should consider the feasibility and appropriateness of establishing a high-flow LTAAEL as a component of the overall LTAAEL to enhance access to water at high flows. Increased capture of runoff via licensed farm dams during genuinely high flows should be adopted where possible, if it can be demonstrated that this can be implemented in a way that does not compromise environmental outcomes. There is limited availability of water within many parts of the plan areas and license holders are of the view that trade limitations are unnecessarily restricting extraction. There may be opportunities to allow additional trade within high flows to provide additional water access, while also alleviating some pressure on low flows (**Section 5**).
- **Strengthening environmental protections** - Monitoring is currently insufficient to assess the effectiveness of environmental protections. Monitoring and evaluation should be improved and provisions revised where necessary to adequately protect aquatic ecosystems. While estuary condition is generally good (supported by good work in the region more broadly to improve riparian condition), more work is needed to ensure provisions maintain this in the future. The needs of environmental systems post-bushfire need to be considered. There are also opportunities to strengthen the protection of GDEs, threatened species and endangered ecological communities, as well as improving the management of connectivity and environmental flows from Cochrane Dam (**Section 6**).
- **Securing town water supply** - While town water supply needs were mostly met over the life of the Plans, provisions are needed to ensure critical human needs are met during emergency events (such as drought and bushfire) and during peak daily demand. There are also opportunities to strengthen town water supply provisions with the latest flow and climate data and ensure risks from saltwater intrusion can be managed (**Section 7**).
- **Improving outcomes for Aboriginal people** - State-wide issues relating to Aboriginal water values, right and uses remain, with several examples in the Plan areas. In particular, the Plans do not recognise the large native title claim of the South Coast People and do

<sup>138</sup> See the Commissions review of the water sharing plan for the Hunter Unregulated and Alluvial Water Sources 2009 available at <https://www.nrc.nsw.gov.au/Final%20report%20-%20WSP%20review%20-%20Hunter%20v1.pdf?downloadable=1>

not protect known Aboriginal water values. The complexity and limitations of licences inhibit meaningful use. Work needs to be done to develop and resource proactive involvement of Aboriginal people in coastal water planning and management (**Section 8**).

### 3.2 Regional planning activities should inform the revised Plans

In response to identified risks to water resources in the South Coast, the NSW Government and Bega Valley Shire Council are completing several strategies that will have implications for the way water is managed under the Plans. The replacement Plans should take these initiatives into consideration and align with them where consistent with the intent and requirements of the water sharing plans, including the priorities under the Act. Key strategies include:

- **South Coast Regional Water Strategy<sup>139</sup>** – 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 South 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.
- **The Bushfire Recovery Action Plan<sup>140</sup>** – The Bega Valley Shire Council developed the Bushfire Recovery Action Plan in conjunction with local subcommittees to provide timely support to affected communities post the 2019-2020 bushfires. The Plan consists of short, medium and longer term objectives and actions to support communities in their bushfire recovery journey. Recovery of electricity and water supply, and provision of feed and water to livestock and wildlife were immediate priorities. Addressing erosion risks on priority waterways was also identified as important to reduce water quality impacts on aquatic ecosystems and water dependent industries such as oyster farmers and tourism.
- **Groundwater model for the Mid Bega Sands River Aquifer** – The Bega Valley Shire Council has commissioned a groundwater model for the Mid Bega River Sands aquifer to look at a range of scenarios. This model will likely have implications for alluvial and town water supply provisions in the Bega Brogo Plan.
- **Proposed Integrated Water Cycle Management Strategy<sup>141</sup>** – is a resourcing strategy for local utilities required by the NSW Government and facilitated by DPIE. Bega Valley Shire Council is developing a strategy to outline how it will provide appropriate, affordable, cost-effective and sustainable urban water services to the community, while protecting public health and the environment. This 30-year strategy will inform Plan consideration of critical human water needs and Plan provisions for local water utilities.

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<sup>139</sup> DPIE-Water (2020) *Draft South Coast Regional Water Strategy*, p. 72. Available at:

[https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0020/329015/draft-rws-sc-strategy.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0020/329015/draft-rws-sc-strategy.pdf).

<sup>140</sup> Bega Valley Shire Council (2020) *Recovery Action Plan – 2019/2020 Black Summer Bushfires*. Available at: [https://begavalley.nsw.gov.au/cp\\_themes/default/page.asp?p=DOC-YJJ-57-32-13](https://begavalley.nsw.gov.au/cp_themes/default/page.asp?p=DOC-YJJ-57-32-13).

<sup>141</sup> DPIE (2019) *Integrated Water Cycle Management Strategy Check List*. Available at: [https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0006/146931/integrated-water-cycle-management-strategy.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0006/146931/integrated-water-cycle-management-strategy.pdf).

- ***The Far South Coast Regional Economic Development Strategy<sup>142</sup> and Marine Tourism Strategy<sup>143</sup>*** - the Economic Development Strategy (2018–2022) sets out a long-term economic vision and associated priorities for the Bega Valley and Eurobodalla shires (including priority industries) and aims to leverage regional strengths. The South Coast Marine Tourism Strategy outlines a 20-year vision to realise the economic benefits of marine tourism in the region. It describes how government and industry can work together to develop, market and leverage marine tourism opportunities (including cultural tourism opportunities). Both strategies can inform the development of the Plans and their socioeconomic objectives.

### 3.3 Overall recommendation

<b>Recommendation (R) 1 – All Plans</b>	The Plans should be: <ul style="list-style-type: none"><li>a) extended for a further two years until 30 June 2023, to allow time to complete data collection, analysis and modelling</li><li>b) replaced by 1 July 2023 supported by the completion of the recommendations of this review and consideration of outcomes from the <i>South Coast Regional Water Strategy</i> and other regional planning initiatives where relevant.</li></ul>
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<sup>142</sup> Bega and Eurobodalla Shire Councils (2018) *Far South Coast Regional Economic Development Strategy 2018-22*. Available at: <https://www.nsw.gov.au/regional-nsw/regional-economic-development-strategies>.

<sup>143</sup> NSW Government (2019) *South Coast Marine Tourism Strategy* Available at: <https://www.nsw.gov.au/regional-nsw/20-year-vision-for-nsw-south-coast-marine-tourism#:~:text=The%20NSW%20South%20Coast%20Marine%20Tourism%20Strategy%20outlines,yield%20throug%20the%20delivery%20of%20its%20action%20plan.>

## 4 Ensuring sustainable extraction

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.

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.<sup>144</sup>

Water sharing arrangements operate using a cap and trade approach with the LTAAEL setting the limit and trade within this limit facilitating movement of water to its highest use. Effective trade rules are important for ensuring that changing economic conditions and new industries can be accommodated within the LTAAEL, while maintaining protections for the environment.

There are several issues related to extraction under the Plans, including:

- the Plans do not set clear, fixed numeric LTAAELs based on sustainable limits (**Section 4.1**)
- Increased basic landholder rights extraction may result in decreased allocations to other users (**Section 4.2**)
- the process for determining AWDs for regulated rivers, which determine how much water each licence holder can extract over a stated timeframe (usually annually), needs to be reviewed in light of the most recent drought experience (**Section 4.3**)
- AWDs are meant to be used to ensure LTAAEL compliance, but LTAAEL compliance has not been assessed during the life of the plans
- the current trade rules are viewed as overly restrictive (see **Section 5.4** for further details).

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<sup>144</sup> Alluvium (2019) *Audit of the Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources 2011*; *Audit of the Water Sharing Plan for the Towamba River Unregulated and Alluvial Water Sources 2010*; *Audit of the Water Sharing Plan for the Murrumbidgee Area Unregulated and Alluvial Water Sources 2010*. Available at: [https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0008/289475/Bega-and-Brogo-Rivers-Area-Regulated,-Unregulated-and-Alluvial-Water-Sources-2011.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0008/289475/Bega-and-Brogo-Rivers-Area-Regulated,-Unregulated-and-Alluvial-Water-Sources-2011.pdf); [https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0009/289503/Towamba-River-Unregulated-and-Alluvial-Water-Sources-2010.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0009/289503/Towamba-River-Unregulated-and-Alluvial-Water-Sources-2010.pdf); [https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0010/289486/Murrumbidgee-Area-Unregulated-and-Alluvial-Water-Sources-2010.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0010/289486/Murrumbidgee-Area-Unregulated-and-Alluvial-Water-Sources-2010.pdf).

## 4.1 Plans lack sustainable, numeric LTAAELs

The Plans establish LTAAELs for each extraction management unit. As with many water sharing plans, these limits are not specified numerically in the Plans but are described as components that comprise the LTAAELs. This includes the sum of share components at commencement of the Plans in extraction management units of all access licences, plus estimated annual water requirements for basic landholder rights and the volume of Aboriginal Cultural licences in specific water sources. Unlike most other water sharing plans, the Plans also include an estimate of harvestable rights within the LTAAEL, which the Commission considers to be good practice.

It would be more transparent and efficient for compliance purposes if the Plans included tables with fixed volumetric LTAAELs.<sup>145</sup> 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
- 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 broadscale metering meant the volume of extraction in the unregulated and alluvial water sources had not been determined.<sup>146</sup> 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. Audits also found there is no procedure for logbooks to monitor usage and whether usage is within account limits.<sup>147</sup>

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<sup>145</sup> Fixed LTAAELs do not increase to accommodate greater extraction of water over the period of the Plan. The LTAAEL should be reassessed at the end of the planning period after the assignment of risk arising from future changes in the availability of water. For extraction management units that are approaching full allocation the fixed LTAAEL should include an allowance for all projected growth from basic rights, exempted access licences and water trades.

<sup>146</sup> Alluvium (2019) *Audit of the Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources 2011; Audit of the Water Sharing Plan for the Towamba River Unregulated and Alluvial Water Sources 2010; Audit of the Water Sharing Plan for the Murrumbidgee Area Unregulated and Alluvial Water Sources 2010*. Available at: [https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0008/289475/Bega-and-Brogo-Rivers-Area-Regulated,-Unregulated-and-Alluvial-Water-Sources-2011.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0008/289475/Bega-and-Brogo-Rivers-Area-Regulated,-Unregulated-and-Alluvial-Water-Sources-2011.pdf); [https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0009/289503/Towamba-River-Unregulated-and-Alluvial-Water-Sources-2010.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0009/289503/Towamba-River-Unregulated-and-Alluvial-Water-Sources-2010.pdf); [https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0010/289486/Murrumbidgee-Area-Unregulated-and-Alluvial-Water-Sources-2010.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0010/289486/Murrumbidgee-Area-Unregulated-and-Alluvial-Water-Sources-2010.pdf).

<sup>147</sup> Alluvium (2019) *Audit of the Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources 2011; Audit of the Water Sharing Plan for the Towamba River Unregulated and Alluvial Water Sources 2010; Audit of the Water Sharing Plan for the Murrumbidgee Area Unregulated and Alluvial Water Sources 2010*. Available at: [https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0008/289475/Bega-and-Brogo-Rivers-Area-Regulated,-Unregulated-and-Alluvial-Water-Sources-2011.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0008/289475/Bega-and-Brogo-Rivers-Area-Regulated,-Unregulated-and-Alluvial-Water-Sources-2011.pdf); [https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0009/289503/Towamba-River-Unregulated-and-Alluvial-Water-Sources-2010.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0009/289503/Towamba-River-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.

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. The Commission understands that DPIE-Water is currently undertaking analysis of sustainable LTAAELs for coastal catchments. Updated LTAAELs based on a sustainability assessment should be included in the updated plans. The LTAAELs for the Plans are given as the sum of access licences and basic landholder rights and can only be varied by any conversion of access licences to high flow licences.<sup>148</sup> The sustainable LTAAEL will need to consider any changes resulting from access to high flow licences for farm dams (**Section 5.2**).

The Plans include AWDs as a tool to manage available water in the regulated system, and for LTAAEL compliance within the unregulated and alluvial systems. However, as no numeric LTAAELs have been established, and LTAAEL compliance assessment has not been undertaken<sup>149</sup>, AWDs have been set at 100 percent regardless of the system's ability to provide water for the unregulated rivers and alluvial aquifers. **Section 4.4** and **4.5** outlines issues related to AWDs in more detail.

Establishing sustainable numeric LTAAELs is a recurring recommendation in the Commission's reviews of coastal water sharing plans. In the *Draft Regional Water Strategy*, DPIE-Water indicates that it intends to draw on new environmental and climate data and modelling to update LTAAELs to reflect sustainable extraction levels. Option 23 of the strategy is to '*establish sustainable extraction limits for South Coast surface water and groundwater sources*'. The Commission notes that the clear intent of the Act is to require establishment of sustainable extraction limits in order to protect water sources and their dependent ecosystems<sup>150</sup>. As such, the Commission views sustainable extraction limits as a necessary requirement of the water sharing plan rather than optional.

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[https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0010/289486/Murrah-Wallaga-Area-Unregulated-and-Alluvial-Water-Sources-2010.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0010/289486/Murrah-Wallaga-Area-Unregulated-and-Alluvial-Water-Sources-2010.pdf).

<sup>148</sup> High flow licence conversions are only permitted in the Bega Brogo and Towamba water sharing plan

<sup>149</sup> Alluvium (2019) *Audit of the Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources 2011*; *Audit of the Water Sharing Plan for the Towamba River Unregulated and Alluvial Water Sources 2010*; *Audit of the Water Sharing Plan for the Murrah-Wallaga Area Unregulated and Alluvial Water Sources 2010*. Available at: [https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0008/289475/Bega-and-Brogo-Rivers-Area-Regulated,-Unregulated-and-Alluvial-Water-Sources-2011.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0008/289475/Bega-and-Brogo-Rivers-Area-Regulated,-Unregulated-and-Alluvial-Water-Sources-2011.pdf); [https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0009/289503/Towamba-River-Unregulated-and-Alluvial-Water-Sources-2010.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0009/289503/Towamba-River-Unregulated-and-Alluvial-Water-Sources-2010.pdf); [https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0010/289486/Murrah-Wallaga-Area-Unregulated-and-Alluvial-Water-Sources-2010.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0010/289486/Murrah-Wallaga-Area-Unregulated-and-Alluvial-Water-Sources-2010.pdf).

<sup>150</sup> See Sections 3, 5, 8, 9 and 20 of the *Water Management Act 2000*.

## 4.2 All 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:<sup>151</sup>

- **domestic and stock rights** – owners or occupiers of land that is overlying 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 (see **Section 5.3** for further discussion)
- **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 due to limited monitoring. There is no monitoring of domestic and stock use. While NRAR undertakes surveillance of harvestable rights dams in some coastal regions as part of its compliance activities, there is no active monitoring by DPIE-Water. However, it is noted that these plans did take into consideration estimates of harvestable rights in determining LTAAEL. No volume of water has been determined under native title rights within the Plan areas, although there is a large registered native title claim covering all Plan areas (see **Section 8**).

Population growth for the Plan areas since 2011 was relatively low and growth projections are below the NSW regional average (see **Section 2.8**) and do not signal significant growth in domestic and stock use alongside town water supply.

Despite this, stakeholders raised concerns about a perceived growth in basic landholder rights (domestic and stock use) caused by subdividing farmland into hobby farms and increasing river-fronting blocks. Recognising that many factors could affect low flows, interviewees reported concerns around the impact of basic landholder right usage in low flow periods:

*'Basic landholder rights is a growing issue –there is a view that hobby farms are expanding and there's no policing and there's no idea of what's happening now and the impacts, there's no data, the more subdivision the more you lose track of it. Basic landholder rights is different on the coast to inland'.<sup>152</sup>*

During the Towamba Plan development stakeholders proposed limitations on riparian users' extractions for basic landholder rights but these restrictions were not included in the Plan. As a result, some stakeholders consider the area is over allocated:

*'Our valley is hugely over prescribed by riparian use (basic landholder rights) when there are very low flows. Creeks are just drying up as a result. Our suggestion was that people have a daily limit in mind of what they pump. That's the fundamental issue we see – we've somehow lost control of the plan'.<sup>153</sup>*

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<sup>151</sup> Sections 52-55 of the Act.

<sup>152</sup> Interview: Local Land Services, 2 February 2021.

<sup>153</sup> Interview: Landcare, 22 December 2020.



WaterNSW also indicated that there are larger than usual basic landholder rights volumes extracted in the Bega Brogo and Towamba areas, which could impact on low flows.<sup>154</sup> This is due to the lack of restrictions on extraction taken under basic landholder rights.<sup>155</sup>

Data are unavailable on the number of new or projected developments and subdivisions that will rely on basic landholder rights. Greenfield development, densification and subdivision resulting in additional properties with river frontage or bores may have implications for basic landholder rights extraction.

One stakeholder also raised that extraction under basic landholder rights can increase as people mitigate risks in times of drought and bushfires.<sup>156</sup> This behaviour increases the take from systems and could further impact on low flows.

DPIE-Water advised it is currently developing a new method to estimate basic landholder rights for future unregulated water sharing plans, which should be available in 2021. In estimating basic landholder rights requirements for the replacement plans, DPIE-Water should consider current and projected development patterns in basic landholder rights requirements and the impact of drought and fire on extraction during emergencies. DPIE-Water should ensure that LTAAEL compliance assessments are completed as required and consider basic landholder rights estimates that have been updated within five years.

As raised in previous reviews, there are currently no transparent guidelines around how much water can be extracted for domestic and stock use through bores or river access<sup>157</sup> ('reasonable use'). WaterNSW noted that the lack of guidelines compounds the challenge of managing users' expectations in low flow times:

*'From my point of view they believe they have right when they need it available. We don't put water down especially for basic landholder rights. Without the dam, water would not be running by, but some people think once there is a dam they should have that water all of the time. All of our departments need a good definition of basic landholder rights and educate the public on what they have to manage around'.<sup>158</sup>*

DPIE-Water advised that it is working towards finalising the reasonable use guidelines and acknowledged the stakeholder concerns about the nature and scope of 'basic landholder rights' to take water for domestic and stock purposes. DPIE-Water advised that it is important that time is taken to understand stakeholder needs and behaviours and to consult with them on options before making recommendations on standards or guidelines. The Commission recognises that formalising the reasonable use guidelines will take time; however, the Commission recommends that DPIE-Water should prioritise the finalisation of reasonable use guidelines and work with agencies to build water user awareness as a priority.

Once basic landholder rights estimates are established, it is critical that all forms of basic landholder rights (harvestable rights, domestic and stock, and native title) are accounted for as part of Plan LTAAELs and actual levels of extraction are monitored.

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<sup>154</sup> Interview: WaterNSW, 11 August 2021.

<sup>155</sup> The Commission notes that the introduction of the Reasonable Use Guidelines may result in a shift in policy on extraction by basic landholder rights.

<sup>156</sup> Interview: Bega Environment Network/South East Forests Conservation Council, 3 February 2021.

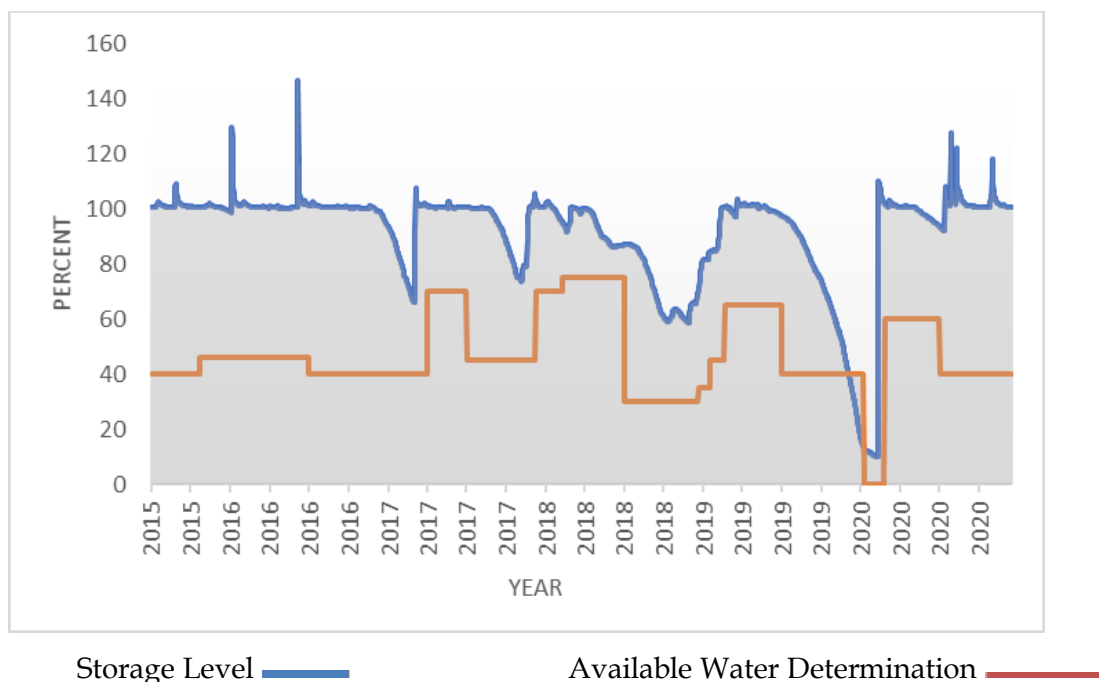
<sup>157</sup> Reasonable use guidelines for domestic consumption and stock watering, as required under Section 336B of the Act.

<sup>158</sup> Interview: WaterNSW, 11 August 2021.

### 4.3 Brogo Dam allocations need to consider extreme droughts

The Act allows for the use of AWDs to determine how much water is credited to each licence holder’s account. This impacts the volume that can be extracted over a stated timeframe, based on the number of unit shares attached to their water access licence.<sup>159</sup> 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.<sup>160</sup> The Plans require that AWDs be made at the commencement of each water year, but they may be increased during the year.

AWDs are set and used differently for the regulated rivers and the unregulated rivers. The Bega and Brogo Plan contains unregulated and regulated rivers (regulated by the Brogo Dam). As Brogo Dam’s storage volume is small relative to entitlement, at the start of each water year the AWD cannot exceed 40 percent using estimates based on the worst drought on record at the start of the plan. As the dam is drawn down, if the storage refills, the AWD can be increased as shown in **Figure 8**, and water accounts updated accordingly. Allocations have increased to as high as 75 percent during the period of the Bega Brogo Plan.



**Figure 8: Brogo storage level and available water determinations**

The small size of Brogo Dam impacts the allocation that can be assigned to active water users in each water year. As highlighted above, water licences are allocated 40 percent at the start of the year. Additional AWD is only provided with drawdown of the dam by water users and subsequent refilling of the dam following a rain event. As subsequent AWD calculation must consider the total entitlement on issue, sleeper licences which don’t extract water, but are provided with an allocation, have a significant impact on the amount of water that can be

<sup>159</sup> As highlighted in Section 2 entitlement is provided as ML for local water utility licences and domestic and stock access licences. For aquifers, unregulated river and regulated river licences entitlement is issued as a unit share with the volume provided per unit share impacted by the available water determination.

<sup>160</sup> WaterNSW (2020) *Available water determinations*. Available at: <https://www.industry.nsw.gov.au/water/allocations-availability/allocations/determinations>.

allocated to active users. This is because water must be kept in the dam for them, and because they do not draw that water down allowing potential for the dam to refill.

**Figure 8** shows Brogo Dam volume as percentage full (blue line) and the AWD's (red line) since 2015. As the graph shows the dam level dropped significantly in late 2019. The 2019–20 AWD was based on the previous worse drought on record. An AWD of 40 percent for general security and 100 percent for other licence categories was announced on 1 July 2019. The level of risk applied modelled that this announced AWD would allow for the dam to provide water for 18 months.<sup>161 162</sup> However, the dam level fell three times faster than anticipated and the dam reached a critical level by January 2020 when the system was at Stage 4 (critical drought/water shortage). A Temporary Water Restriction Order was gazetted on 8 January 2020, prohibiting take of water of the remaining general security access licence accounts, in order to conserve water for critical human needs. The rapid decline in dam levels was unprecedented. New approaches to managing water security and AWD need to be considered to address the significant risks that such rapid declines will reoccur.

The 2019–20 drought demonstrates that even a 40 percent allocation when the storage was near full does not provide sufficient water for general security water users during intense drought. The Plan does not, like many other plans, specify AWD must be based on the worst period of drought at the commencement of the Plan. Rather, it indicates that the AWD must be based on the latest information available. As the 2019–20 drought represents the new worst period of low inflows to the Bega and Brogo Regulated Rivers Water Source, this sets a new benchmark. This may mean that AWD would have to be set well below 40 percent at the start of the year, further exacerbating stakeholder concerns about water availability. However, management of the dam could also focus on the rate of decrease in dam levels to facilitate a timely response. The potential use of triggers to adjust access to water allocation based on the rate of decline in storage levels in Brogo Dam is discussed in the following section.

#### **4.4 Improved drought management tools should be implemented**

The *South Coast Regional Water Strategy* is exploring options for improving drought security. Modelling that has informed the *South Coast Regional Water Strategy* should be used to determine the critical inflow sequence for the regulated river and potential triggers for adjusting management. As part of the Regional Water Strategy, the department will re-consider the current risk-balance between allocating water for productive use and the need for water security, especially for towns. It will do so in the context of expanded climate data and hydrological modelling, as well as using socio-economic data to evaluate solutions.

The current approach to managing water during droughts is reducing take through temporary water restrictions (Section 324 Orders). Restrictions are used to re-assign water from lower to higher priority (critical) needs progressively as a water shortage becomes more severe.

Experiences with the recent drought highlight limitations in the Bega Brogo's Plan's ability to respond to drought conditions in the regulated system. In remaking the Plan, DPIE-Water should include more proactive and transparent measures for responding to drought. This should include:

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<sup>161</sup> Provision of 18 months of water relates to ensuring sufficient water for local water utility licences for Bega Valley Shire Council.

<sup>162</sup> DPIE-Water advised that the AWD assessment covers a period of 36 months and sets aside water for high priority commitments (including town water) prior to allocating water for general security licences.

- developing a drought management plan that specifies triggers for response
- clear indication of what response will be taken for each trigger, including early reductions in access to water allocation to avoid complete suspension of the plan
- documentation of the purpose and calculations behind the drought management plan for transparency.

The Plan should include triggers for temporarily adjusting access to water allocation in the event that drought conditions are occurring. This would allow for more proactive management of available water during drought as well as providing transparency for users in regards to how water access may be impacted during times of drought. DPIE-Water should also improve transparency around the purpose and calculation of AWD's to help licensees to manage their own risks under different circumstances.

In remaking the Plan, DPIE-Water should evaluate the current Plan provisions and determine if they meet the desired risk in balancing water security and availability for extraction, and evaluate options for managing drought response taking into consideration:

- the recent experience where the drought lasted for less than 12 months and the ability of the current AWD's to manage droughts shorter than the allocation period
- the risk of various water allocations and the risk appetite considering extended climate data and socio-economic analysis
- the impacts upon water users and water security from applying non-timely cease to pump section 324 orders
- the ability of triggers for adjusting access to water allocation during drought to achieve a more responsive and graduated decline in water storage
- the risk to environmental values during periods of temporary water restrictions
- the risk of saline intrusion further upstream in the Bega River and into Mid Bega River Sands aquifer during periods of reduced water availability and the risks this poses to town water supply<sup>163</sup>
- the likelihood of reduced AWDs leading to lower average use and reduced economic outcomes
- the interrelationships between water sharing rules in the regulated, groundwater and unregulated water sources.

#### 4.5 AWDs in unregulated rivers and alluvial water sources

While the Plans include AWD provisions, these provisions are not being implemented to ensure compliance with LTAAELs (see **Section 4.1**). 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 2.6**).

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

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<sup>163</sup> At least 50 percent of town water supply comes from the Mid Bega River Sands aquifer.

extraction against LTAAELs. Instead, during the term of the Plans, all categories of access license in unregulated and alluvial sources have received AWDs of 1 ML per unit share or 100 percent per year<sup>164</sup>. The AWD will remain at 1 ML per unit share or 100 percent per year unless there has been a significant increase in basic landholder rights.

The Commission considers that, in the longer term, DPIE-Water should consider the possibility of using AWDs to manage water allocation in unregulated systems during severe droughts, particularly where there is a high ratio of extraction to river flow. The Commission recognises that this would be resource intensive and may require additional personnel within DPIE-Water given the number of unregulated systems across NSW. The allocation of personnel to systems where there is a high ratio of extraction may focus some of these efforts. While cease to pump rules restrict total extraction of low flows, 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.

## 4.6 Recommendations

<p><b>R 2 – All Plans</b></p>	<p>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:</p> <ul style="list-style-type: none"> <li>a) establish and publish sustainable fixed, numeric LTAAELs, ensuring they are based on best available information, including ecological requirements, an accurate estimate of basic landholder rights and climate change</li> <li>b) 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.</li> </ul>
<p><b>R 3 – Bega Brogo</b></p>	<p>To improve the effectiveness of water management during drought, DPIE-Water should:</p> <ul style="list-style-type: none"> <li>a) assess level of risk desired in balancing water security and availability for extraction for managing for drought response</li> <li>b) based on the outcomes of (a) review the AWD provisions for Brogo Dam, considering lessons from the recent drought, increased understanding of climate and river losses</li> <li>c) include provisions in the remade Plan that identify clear triggers for adjusting access to water allocation during drought.</li> </ul>

<sup>164</sup> 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-Variou-N-S-W-Unregulated-and-Alluvial-Water-Sources-No.-2-190701.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/234427/Water-order-Variou-N-S-W-Unregulated-and-Alluvial-Water-Sources-No.-2-190701.pdf); DPIE-Water (2019)

## 5 Enhancing economic opportunity while reducing stress on low flows

Pressure on low flows as well as limited economic opportunities remain key issues for these plans. The plans include mechanisms such as high flow conversions intended to reduce pressure on low flows, but these conversions were not taken up (**Section 5.1**). License holders are interested in improving access to high flows to facilitate access to a greater total volume of water. This would enhance economic opportunities for water users, given the limitations on access to low flows and current restrictions on trade.

The Commission recognises that there is existing work underway by DPIE-Water including the harvestable rights review that may result in enhanced economic opportunities for water users. Given the harvestable rights review has implications for the south coast water sharing plans, the Commission has sought to address initial findings from this review, in conjunction with existing plan rules, to identify potential solutions that may reduce pressure on low flows while providing opportunities for access to water. The Commission's analysis indicates that a change to the existing harvestable rights policy does not represent the best approach to providing access to high flows and will not alleviate pressure low flows.

The Commission is of the view that enhanced opportunities for water users could be achieved through licensed farm dams that access high flows, and that this approach may be suitable in the Bega Brogo Plan. While the Commission recognises that water users can currently access licensed water using farm dams, the proposal outlined by the Commission requires a several step process that differs from the current opportunities available to water users under the existing water sharing plan. This approach requires:

- Determination of the 'high flow' that provides sufficient incentive for capture by water users. Current high flow conversions permitted within the Plans are based on a 50<sup>th</sup> percentile flow, which is the average flow, rather than targeting irregular but very large flows that occur on the south coast. This has resulted in conversions that do not capture the volumes to warrant investment in dam infrastructure by landholders. If access to only the very large flows were targeted, rather than the 50% percentile flow upwards, it may be possible to increase the volumes water users have access to whilst requiring bypasses for all smaller flows. This would result in greater volumes captured at high flow periods and more water available for the environment at low and medium flows. Work would need to be undertaken by DPIE-Water to determine the percentile flow that correlates to the significant rainfall and large flow volumes (**Section 5.2**)
- Consideration of a high flow LTAAEL (as a component of overall Plan LTAAELs) to enable access to a larger volume of water in a manner that will not negatively impact environmental outcomes (**Section 5.2**)<sup>165</sup>
- A review of trade rules to free up additional entitlement where analysis of environmental needs indicates that there is the ability of a water source to hold high flow LTAAEL entitlement (**Section 5.4**).

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<sup>165</sup> The Commission recognises that to implement high flow LTAAELs will require monitoring infrastructure. Licensed dams will allow for the requirement of monitoring infrastructure as a condition of the works approval. Some additional gauging considerations for the Plan area are discussed in **Section 6.2**.

Any options adopted should include demonstration that environmental outcomes can be maintained or improved, and should reduce pressure on low flows, rather than merely providing additional access to high flows.

## 5.1 High flow conversion provisions have not been effective in reducing pressure on low flows

Across the Plan areas, there is significant pressure on the unregulated systems during low flow periods, due to landholders seeking to gain access to water during dry periods to maintain irrigation for fodder production and water for stock. Comparison of entitlement against flows during dry years highlights this issue, where the volume of water that can be extracted by water users represents a higher proportion of total flows in these periods.<sup>166</sup> Plan provisions become critical during low flow periods to ensure planned environmental water is available for downstream environmental assets.

Low flows are important for maintaining river connectivity, particularly during dry periods, and maintaining the salinity gradient between river and estuarine environments. Under the current plan, rules to protect low flows across the south coast plans included high flow conversions, CTPs and TDELs. As outlined in **Section 6.1** and **6.2**, the environmental water needs of water dependent assets across the south coast plan area, including their needs for low flows should be determined based on best available evidence. Where evidence indicates that current rules within the Plan are inadequate to manage the required flows, rules should be reviewed and adjusted as appropriate.

When the Bega Brogo Plan commenced, the South Coast Water Management Committee recommended a target of 20 percent reduction in low flow hydrologic stress for the Bega Brogo catchment.<sup>167</sup> Pressure on low flows will likely continue and be exacerbated due to climate change. The *Draft South Coast Regional Water Strategy* projects that the 95<sup>th</sup> percentile flow will decrease in magnitude by approximately 30 percent across the regulated and unregulated rivers, with a 23-31 percent increase in the number of cease to flow events in the Bega unregulated system.<sup>168 169</sup> The issue of system pressure during the low flow period at Plan commencement was observed as an ongoing problem for the Bega Brogo Plan during the Commission's consultation process. Stakeholders indicated that there were significant tensions between water users during low flow periods, in particular:

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<sup>166</sup> At Plan commencement, in the driest calendar year for the Bega catchment, entitlement represented 36 per cent of total inflows, whereas in the wettest year entitlement was just 4 per cent of inflows. See Office of Water (2011) *Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources – Background document*. Available at:

[http://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0006/547287/wsp\\_bega\\_background.pdf](http://www.water.nsw.gov.au/__data/assets/pdf_file/0006/547287/wsp_bega_background.pdf).

<sup>167</sup> Office of Water (2011) *Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources – Background document*. Available at:

[http://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0006/547287/wsp\\_bega\\_background.pdf](http://www.water.nsw.gov.au/__data/assets/pdf_file/0006/547287/wsp_bega_background.pdf).

<sup>168</sup> The Draft Regional Water Strategy – South Coast has determined likely climate change impact scenarios based on a stochastic (modelled) dataset developed using observational rainfall and evaporation records. Stochastic modelling (using statistical methods to extend the data) results in a dataset covering up to 10,000 years.

NARClm has been used to refine broad scale global climate change models to a more regional scale, that can be used to adjust the stochastic data set for climate change impacts. See DPIE (2020) *Regional Water Strategies Guide*, Chapter 3 and Attachment 2. Available at:

[https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0006/308994/rws-guide.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0006/308994/rws-guide.pdf)

<sup>169</sup> DPIE (2020) *Draft Regional Water Strategy – South Coast*. Available at:

[https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0020/329015/draft-rws-sc-strategy.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0020/329015/draft-rws-sc-strategy.pdf).

- scrutiny of releases from Cochrane Dam and the ability of these releases to meet the 2 ML per day flow at Kanoona gauge (see **Section 6.6**)
- concerns about equity of irrigation and town water supply restrictions<sup>170</sup>
- concerns about ongoing access by basic landholder rights users during low flows.<sup>171,172</sup>

Under the current Plans, high flow conversions are the principal mechanism to shift water use behaviour into high flows and relieve pressure on the low flows. While there was anecdotal evidence of one high flow conversion in the Towamba Plan during the plan period, DPIE-Water advised that there have been no high flow access conversions over the life of the Plans (where these have been permitted).<sup>173</sup> Stakeholder feedback did not identify any barriers to the uptake of high flow access conversions. The Commission considers it may be due to an unwillingness to surrender access to water during low flow periods, which would be viewed as a significant risk to maintaining production viability, and the establishment of high flow at the 50<sup>th</sup> percentile that results in limiting the volume of water that can be provided for through conversions (see **Section 5.2**).<sup>174</sup> Determination of the percentile flows that correlate to the capture of larger volumes of water that occur with the high rainfall events will require assessment by DPIE-Water.

The following sections outline alternative options for moving extraction to high flows, which should be considered in the plan remakes.

## 5.2 High flow LTAAEL could relieve pressure on low flows

The Commission notes that some of the unregulated systems are overallocated with exacerbated pressure at low flows. While high flow conversions are available, these are based

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<sup>170</sup> The Act prioritises town water over other licensed extraction. 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*'.

<sup>171</sup> Interviews: Bega Chamber of Commerce, 1 February 2021, Bega Cheese, 11 February 2021, DPIE-Water, 17 December 2020, Local Land Services, 2 February 2021, Landcare, 22 December 2020.

<sup>172</sup> The Commission notes that the Act does not place any restrictions on take of water for basic landholder rights during periods of low flow. The Commission heard feedback during its consultation process that this represented a 'step backwards' from informal water sharing arrangements in place in the community, whereby at a certain flow all users including those drawing water for the purpose of basic landholder rights, where suspended from extracting water.

<sup>173</sup> High flow conversions were in place across the Bega Brogo Plan, excluding the Upper Brogo River and the Bega River Estuary Tributaries water sources (Office of Water (2011) *Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources – Background document*. Available at: [http://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0006/547287/wsp\\_bega\\_background.pdf](http://www.water.nsw.gov.au/__data/assets/pdf_file/0006/547287/wsp_bega_background.pdf)). High flow conversions were not permitted in the Murrrah-Wallaga Plan and restricted to the Towamba extraction management unit, excluding water sources where there was no current entitlement, due to a modelled insufficient reduction in low flow hydrologic stress (Office of Water (2010) *Water Sharing Plan for the Murrrah-Wallaga Area Unregulated and Alluvial Water Sources – Background document*. Available at: [https://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0011/547904/wsp\\_murrrah\\_wallaga\\_background.pdf](https://www.water.nsw.gov.au/__data/assets/pdf_file/0011/547904/wsp_murrrah_wallaga_background.pdf); Office of Water (2011) *Water Sharing Plan for the Towamba River Unregulated and Alluvial Water Sources – Background document*. Available at: [http://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0009/549198/wsp\\_towamba\\_river\\_background.pdf](http://www.water.nsw.gov.au/__data/assets/pdf_file/0009/549198/wsp_towamba_river_background.pdf))

<sup>174</sup> Additional barriers may include costs associated with storage infrastructure construction and maintenance, purchase of additional pump and pipeline infrastructure and approval costs. The Commission notes that costs involved in dam construction is one of the key reasons water users are seeking certainty in water allocation and require sufficient volumes to meet necessary business cost benefit analysis.



on the 50<sup>th</sup> percentile of flows, which results in relatively small conversion volumes. The Commission believes that the small volumes resulting from the high flow conversion process is one of the reasons for limited adoption of these licence categories and has resulted in ongoing competition for water amongst users at periods of low flow. As such, stakeholders are seeking alternate options to access greater volumes of water during periods of high flows, which are known to occur following high rainfall periods, including a review of the current harvestable rights policy (see **Section 5.3**). The Commission notes that there was an expectation when the Plans were developed that more entitlement would become available through the sale of sleeper licences, but this has not occurred over the life of the Plans (see **Section 5.3**).<sup>175</sup>

While there are rules in place that seek to protect environmental values during low flows (for example, CTPs and TDEs), given the lack of adoption of high flow conversions and ongoing pressure at low flows,<sup>176</sup> there is a need to consider alternate solutions to enable this shift in water user behaviour. Current LTAAELs do not necessarily recognise the timing of extraction, the availability of water and the implications for different flow classes. Further, current LTAAELs do not recognise that some industries have the capability to invest in high flow extraction and are seeking the certainty within the Plan to invest in infrastructure to capture and store these high flows.

Facilitating trade into high flow would allow the market to reduce stress at low flow and requires a change to the current high flow conversion policy. Setting LTAAELs that includes a specific high flow component as a part of the overall LTAAEL, could allow for protection of the environment while maximising economic and social outcomes.<sup>177</sup> It is evident that the 50<sup>th</sup> percentile of flows does not allow for the capture of sufficient volumes of water, triggering a need to assess the percentile of flow that is correlated to the large rainfall events typical of the south coast area. This assessment of the percentile that triggers capture of these larger volumes will need to be undertaken by DPIE-Water. Evidence of some of the high flow volumes that have been recorded for the 2000-2020 period in the Bega Brogo and Murrah-Wallaga Plan areas are provided in **Figure 9**. Determination of the percentile flow to be classed as 'high flow' that would allow for sufficient volume of capture by water users as a sufficient incentive to change water user behaviour requires analysis by DPIE-Water. As part of this analysis, DPIE-Water would need to consider the level of management required including any additional metering and monitoring compared to the risk and ability to implement this change effectively. It would also be necessary for DPIE-Water to consider any environmental impacts associated with the change in classification of high flow.

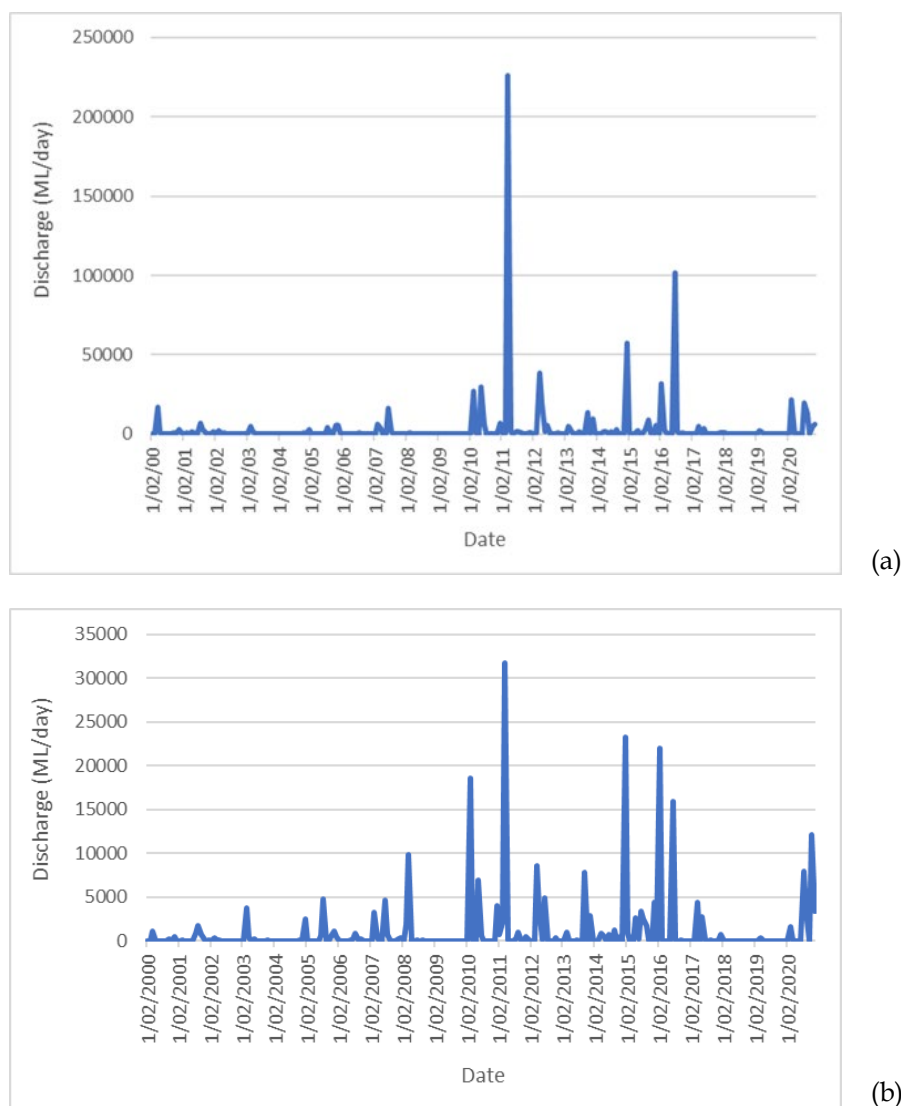
The Commission recognises that to enact the high flow licence classes, there would need to be an overarching review of trade rules in the Plans. Considerations to be covered within this trade review are outlined in Section 5.4.

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<sup>175</sup> The failure of licence holders to relinquish sleeper licences may be due to the restrictions in trade across the south coast plans. The Commission also heard feedback from stakeholders that many holders of sleeper licences have retained these due to the higher perceived value of land sales when property is sold as a land and water 'package'.

<sup>176</sup> As noted in Section 5.1, the South Coast Water Management Committee recommended a 20% reduction in low flow hydrologic stress for the Bega Brogo Plan at commencement. The Commission also heard feedback from stakeholders indicating that pressure on rivers and creeks during periods of low flow across the south coast plans, but particularly in the Bega Brogo Plan is ongoing.

<sup>177</sup> Any consideration of LTAAEL adjustment will need to occur in conjunction with the overall review of LTAAEL as part of the Plan remake that seeks to ensure the incorporation of a sustainable, numeric and fixed LTAAEL (see Section 4.1)



**Figure 9: Maximum flow discharge volumes (ML/ day) on a monthly basis for the period 1 January 2000- 31 December 2020 at the (a) Kanoona gauge in the Bega Brogo Plan area and (b) Quaama gauge in the Murrah- Wallaga Plan area<sup>178</sup>**

### 5.3 Additional access to high flows via licenced farms dams should be considered where appropriate

Water held in farm dams is only partially regulated by the Plans. Harvestable rights are part of basic landholder rights.<sup>179</sup> As such, farm dams capturing only harvestable rights do not require a licence. Farm dams do require a licence under the Plans 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. Rules that govern the capture of water in farm dams are established

<sup>178</sup> Data taken from WaterNSW Real time data Available at: <https://realtimedata.waternsw.com.au/>, accessed 4 May 2021

<sup>179</sup> 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.

outside the plans under the harvestable rights policy and regulated by the NSW Government Gazette. Under the current harvestable rights policy landholders in the Plan area can capture 10 percent of average regional rainwater runoff on their land, with certain limitations.<sup>180</sup>

In recent years, NSW coastal water users have raised concerns that the current harvestable rights policy is not effective for their regions and have called for a review of the harvestable rights policy.<sup>181</sup> These concerns were reflected in stakeholder feedback for this review. Stakeholders in the region consider the current harvestable rights policy is more reflective of the needs of inland areas and is not fit for purpose for the coast, which experiences significantly different rainfall patterns.

During the Commission's consultation for this review, a broad range of stakeholders in the region considered that the harvestable rights policy in coastal areas should allow for harvesting of larger volumes of runoff during high flow periods, which occur more frequently in coastal areas, to:

- allow access to additional water to support irrigation industry and provide additional water security for infrastructure investment
- reduce costs of pumping
- provide a mechanism and incentive for water users to move out of low flows
- support emergency response such as firefighting through the construction of additional farm dams
- increase resilience to changes in the timing and intensity of rainfall events.<sup>182,183</sup>

The Commission notes there has been some indication from water users that they support increased harvestable rights, while maintaining current entitlement within low flows. This contrasts with other stakeholders who support harvestable rights increases as an opportunity to relieve pressure on low flows. The Commission does not support the maintenance of current entitlement with a concurrent increase to harvestable rights (or increase in access via licensed farm dams), where it has been recognised there needs to be a shift in low flow usage patterns. In light of stakeholder feedback and given the relevance of any potential shift in harvestable rights policy for the south coast plans, the Commission considered the draft findings of the harvestable rights review. Findings stemming from this review are outlined in **Section 5.3.1** and **5.3.2**.

### **5.3.1 DPIE modelling indicates potential to increase high flow access in Bega Brogo**

DPIE-Water is currently undertaking a review of coastal harvestable rights. In December 2020 (during the consultation period for this review), a discussion paper of initial findings was released, including early modelling of the potential impact of various policy changes (see **Box 1**). Modelling included two water sources from the Bega Brogo Plan (Lower Bega / Lower

<sup>180</sup> 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](https://gazette.legislation.nsw.gov.au/so/download.w3p?id=Gaz_Gazette%20Split%202006_2006-40.pdf).

<sup>181</sup> DPIE-Water (2020) *Coastal Harvestable Rights Review – Discussion Paper*. Available at: [https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0003/341535/discussion-paper.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0003/341535/discussion-paper.pdf).

<sup>182</sup> Interviews: Bega Environmental Network, 3 February 2021, Landcare, 22 December 2020, Local Land Services, 2 February 2021, Rural Recovery Program, 16 February 2021 and Regional NSW, 9 February 2021.

<sup>183</sup> DPIE-Water's harvestable rights discussion paper identified that farm dams can act artificial refuges for wildlife in upstream areas, noting that this can still impact on natural downstream environments particularly during periods of low flows.

Brogo Rivers Tributaries and Upper Bega / Bemboka Rivers), which are considered to have greater demand from water users for irrigation.<sup>184</sup>

#### Box 1: Summary of modelling scenarios used in DPIE-Water's harvestable rights review<sup>185</sup>

The modelling scenarios for the harvestable rights review focused on:

- **a range of potential percentage increases to the allowable harvestable rights:** modelled current scenario of 10 percent as well as 20, 30 and 50 percent
- **changes to permissible locations for a harvestable rights dam:** to allow harvestable rights dams on third order streams, non-permanent first and second order streams and unmapped streams.

These scenarios then investigated the impact of these changes according to the level of stakeholder uptake of the policy (25, 50, 75 and 100 percent rate of uptake). In determining exclusions to apply to the level of uptake modelling determined that harvestable rights dams would not be constructed on the following:

- land that is national park, state forest or road reserves
- as an addition or expansion of an existing structure where the current dam was less than 1 ML.

For the two modelling sites in the Bega Brogo Plan area, DPIE-Water's modelling found that:

- the current uptake of harvestable rights has been reasonably high (Double Creek catchment (66 percent) and Bega-Bemboka (65 percent))
- the impact of an increase in harvestable rights allocation on flows is most significant in dry years<sup>186</sup>
- an increase in harvestable rights resulted in a reduction in the mean duration of freshes in low flow periods<sup>187</sup>
- there is likely to be a significant impact on freshwater ecosystems and some impact on coastal ecosystems (i.e. estuaries) through an increase in harvestable rights.<sup>188</sup>

DPIE-Water's early findings also indicate that the impacts of increasing harvestable rights vary significantly between catchments.<sup>189</sup> This is expected given the different geomorphology and

<sup>184</sup> Note - most estuaries in the Plan areas are in the Towamba and Murrumbidgee regions.

<sup>185</sup> Hydrology and Risk Consulting (2020) *Review of harvestable rights for coastal catchments, modelling component*. Document prepared for DPIE-Water.

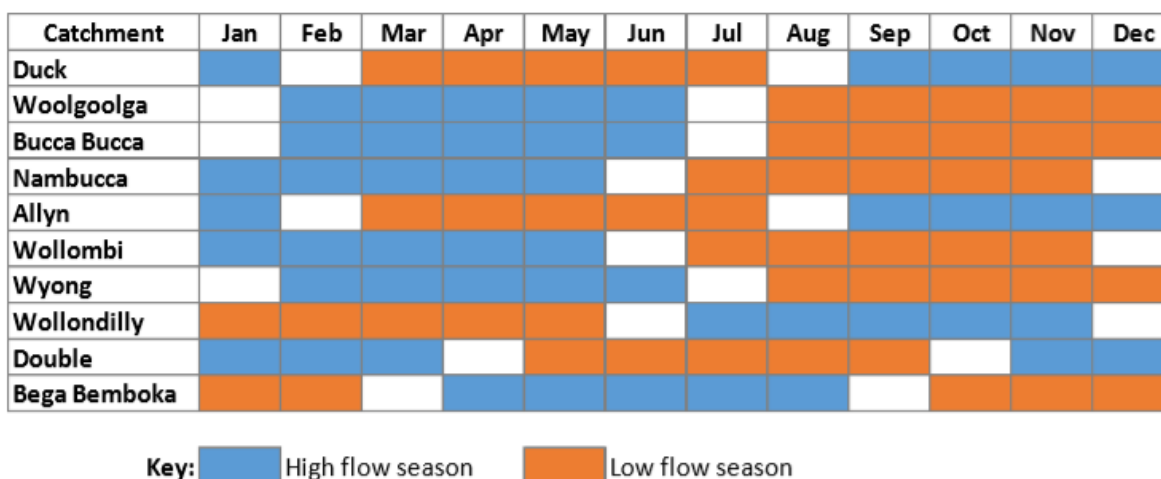
<sup>186</sup> Data presented in the Hydrology and Risk Consulting modelling report indicates that the approximate impact on flows is approximately 20-22% in Double catchment and 24-27% Bega Bemboka catchment versus an approximate 10% impact on flows under the current harvestable rights policy. It is noted that the impact on flows is 17 and 20% with 100% uptake of the current harvestable rights policy for Double and Bega Bemboka catchments respectively. This comparison was determined using information presented in Figure ES4 in the Hydrology and Risk Consulting modelling report, based on the comparison of existing harvestable rights policy, 100% uptake of the existing policy and impacts modelling under the scenario increasing harvestable rights to 20% and 50% with 100% uptake of harvestable rights by water users.

<sup>187</sup> Data presented in the Hydrology and Risk Consulting modelling report indicates minimal change to the duration of freshes in the Double catchment, with the duration fluctuating on average by one day with an increase in harvestable rights. The duration of freshes on average were impacted by approximately 1-2 days in the Bega Bemboka catchment with an increase in harvestable rights.

<sup>188</sup> The Hydrology and Risk Consulting modelling paper identified that they had only broadly identified impacts to flows, with different flow scenarios used as a proxy measure to identify where changes in ecological health may result from changes to flow. Given the focus on hydrologic change, the paper suggested that a more nuanced assessment of potential impacts on environmental flows be undertaken, involving the expertise of ecologists and geomorphologists to get a better understanding of changes to ecological outcomes.

<sup>189</sup> DPIE-Water (2020) *Coastal Harvestable Rights Review - Discussion Paper*. Available at: [https://www.industry.nsw.gov.au/\\_data/assets/pdf\\_file/0003/341535/discussion-paper.pdf](https://www.industry.nsw.gov.au/_data/assets/pdf_file/0003/341535/discussion-paper.pdf).

rainfall patterns of the coastal regions. The south coast region in general has smaller catchments due to its proximity to the Great Dividing Range and lower rainfall relative to the north coast.<sup>190</sup> Seasonal variation of dominant rainfall is common across catchments, with periods of low and high flow inversely related (**Figure 10**). This figure shows rainfall in catchments in a number of coastal plans. The last two lines of the table show the Double and Bega Bemboka catchments, which are both within the Bega Brogo Plan area, but have significantly different high and low flow patterns.



**Figure 10: High and low flow periods by catchment<sup>191</sup>**

**NB: Only Double and Bega Bemboka are catchments within the Bega Brogo Plan area, other catchments fall within other coastal zones**

It is noted that the south coast catchments within the Bega Brogo Plan area modelled for the purpose of the harvestable rights paper are considered ‘medium’ size,<sup>192</sup> while many of the catchment sizes across the Towamba and Murrah-Wallaga plans are significantly smaller.<sup>193</sup> Given the variability of catchment size across the south coast plans, a blanket approach to changes to the harvestable rights policy even within Plan areas will not be fit for purpose, and a catchment specific approach to modelling of impacts that considers climate change will be required.

Based on information presented in the DPIE-Water modelling the Commission does not consider it appropriate to make changes to access to runoff via farm dams within the Towamba and Murrah-Wallaga plan areas given the potential for impact on riverine and coastal ecosystems, as they have a high density of ICOLs and extraction sensitive threatened species and endangered ecological communities (see **Section 6.1**). In the event that changes to access to

<sup>190</sup> DPIE-EES (2020) *Form and Function of NSW Intermittently Closed and Open Lakes and Lagoons*. Provided by DPIE-EES

<sup>191</sup> Note that Double and Bega Bemboka catchment are in the Bega Brogo Plan (Hydrology and Risk Consulting (2020) *Review of harvestable rights for coastal catchments, modelling component*. Document prepared for NSW DPIE-Water).

<sup>192</sup> Hydrology and Risk Consulting (2020) *Review of harvestable rights for coastal catchments, modelling component*. Document prepared for NSW DPIE-Water.

<sup>193</sup> Across the three plans the Bega River estuary has the largest catchment area of 1,934 square kilometres, Towamba estuary is approximately half this catchment size at 1,026 square kilometres. Twenty-four of the estuaries have catchment sizes of under 100 square kilometres (based on data provided by DPIE-EES, available via the SEED portal).

runoff via farm dams were to be considered for the Towamba and Murrumbidgee Plans, this must be supported by:

- modelling to determine potential changes to hydrology
- ecological and geomorphological studies, and
- a strong compliance regime.

This should aim to avoid any potential impacts on ICOLLs, threatened species and endangered ecological communities or ensure that they can be appropriately managed. The Commission acknowledges the significance of ICOLLs for commercial and recreational fishing, cultural, tourism, social and conservation purposes and is seeking to avoid any impacts of extraction on these highly valuable environmental assets. Key threats to environmental assets within the south coast Plans and considerations required by the Plans to meet the environmental flow requirements of ICOLLs and environmental assets are outlined in **Section 6.2** and **6.3**.

Where further investigation of increased access to high flows via farm dams indicates that this cannot be used as a tool to move water users out of low flows, other policy mechanisms to encourage this shift should be investigated in the development of the replacement Plans. This should include a review of barriers to the uptake of the current high flow conversions policy.

Based on the DPIE-Water modelling, there is potential for changes to harvestable rights policy for the Bega Brogo Plan area as a mechanism to access water during periods of high flow and provide water security for irrigation industries. However, further modelling is warranted to ensure that any impacts on freshwater ecosystems and coastal ecosystems (i.e. estuaries) are fully understood and accounted for and that this additionally considers the changes to streamflows already anticipated as a result of climate change. The Commission notes that any change to access to water via farm dams for the Bega Brogo Plan area would require a strong compliance regime that would need to be supported by metering and monitoring.

### **5.3.2 Licensed farm dams could accomplish same outcomes as increased harvestable rights**

As highlighted in **Section 5.3**, harvestable rights are outlined in the Government gazette, resulting in any management of these rights occurring outside the Plans. Given this, any update to increase harvestable rights access for the south coast plans would represent a significant step change in how water is managed in NSW, and a shift away from current water sharing plan arrangements.

In addition, the south coast Plans are unique in that they are the only water sharing plans to include an estimate of harvestable rights take as part of the numeric calculations of the LTAAEL. Due to this any change in harvestable rights policy would have the resulting impact of requiring a reduction in the AWD for licenced water users, as any increase in intake by harvestable rights would need to be considered and accounted for in the LTAAEL.

**Table 9** outlines the potential options for enhancing access to high flows, under the current Plan scenario, via an increase in harvestable rights and through high flow capture in licensed farm dams. Consideration of these options are mapped against current Bega Brogo Plan objectives, highlighting the pros and cons of the suggested mechanisms.

Given the challenges of an increase in harvestable rights and ongoing issues with high flow conversions, the Commission views that access to high flows could best be achieved via

introduction of high flow LTAAELs and licensed extraction into farm dams rather than any changes to harvestable rights policy. This would have several benefits, including:

- ensuring that dam infrastructure can be regulated via licence conditions to avoid capture of low flows
- utilising trade to shift water user behaviour
- maintaining rules that restrict access to low flows such as CTPs and TDELS
- ensuring that water sharing arrangements continue to sit within the Plan
- consistency with objectives of the Plan (See **Table 9**).

**Table 9: Comparison of options for reducing pressure on low flows**

Bega Brogo Plan Objectives	Current water sharing plan arrangements	Increase Harvestable Rights	Licenced capture of water in farm dams via high flow LTAAEL plus improved trading <sup>194</sup>
<p><i>(b) protect, preserve, maintain and enhance the important river flow dependent and high priority groundwater dependent ecosystems of these water sources</i></p>	<p>Ongoing pressure on low flows. High flow licence conversions principal mechanism to change water user behaviour.</p> <p>Trading rules protect flow dependent and high priority groundwater dependent ecosystems.</p> <p>CTPs and TDELs rules used to manage low flows.</p>	<p>No need to utilise high flow conversion. Potential for harvestable rights to access both high and low flows as no ability to regulate capture of water.</p> <p>A change to harvestable rights would limit trading rule restrictions where these are required to protect, preserve, maintain and enhance the important river flow dependent and high priority groundwater dependent ecosystems.</p> <p>CTPs and TDELs cannot effectively manage impact to low flows.</p>	<p>Generates a high flow licence category that shifts water users out of low flows. Avoidance of capture of low flows can be regulated via conditions on licences. Monitoring infrastructure can be included as a condition on the licence works approval.</p> <p>Trading rules can continue to protect flow dependent and high priority groundwater dependent ecosystems.</p> <p>CTPs and TDELs can continue to be used to manage low flows.</p>
<p><i>(d) protect basic landholder rights</i></p>	<p>Current basic landholder rights are protected.</p>	<p>Increased upstream harvestable rights can reduce flow to downstream users impacting on downstream basic landholder rights.</p>	<p>Upstream extraction can be managed via licences to maintain flow to downstream users maintaining current basic landholder rights across the system.</p>
<p><i>(f) provide opportunities for market based trading of access licences and water allocations within sustainability and system constraints</i></p>	<p>Trade currently restricted due to high value environmental assets.</p> <p>The only trade opportunity available is via high flow conversions; potential to capitalise on this is limited due to high</p>	<p>No need for any reassessment of current trade provisions.</p> <p>Changes to harvestable rights policy would remove incentive of users to trade and reduce the value of existing licences.</p>	<p>Requirement for reassessment of trade provisions.</p> <p>Improved opportunities to utilise trade to access additional volumes of water entitlement if these are set at high flows</p>

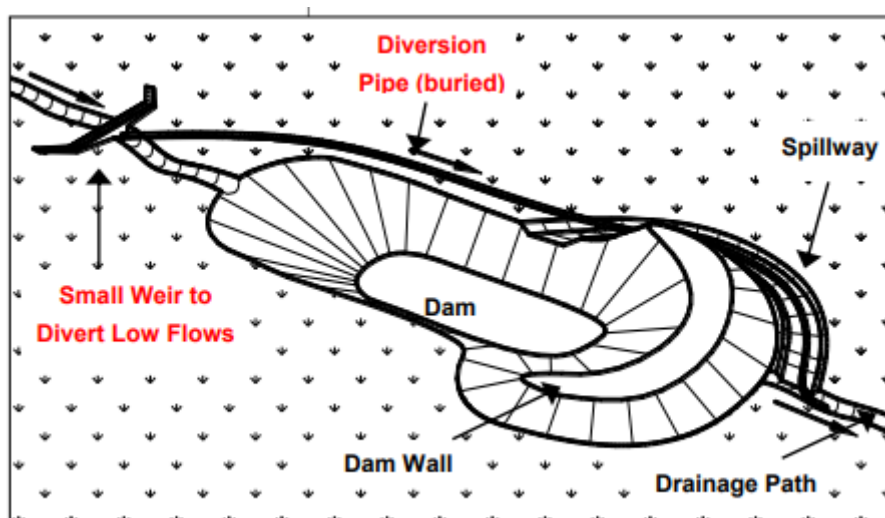
<sup>194</sup> The Commission notes that licenced capture of water is already available under the south coast plans. The differences in arrangements currently available to water users under the Plans and the Commission’s proposal have been outlined in Section 5. This column seeks to provide a comparison of current arrangements, change in harvestable rights policy and capture via a high flow LTAAEL.



Bega Brogo Plan Objectives	Current water sharing plan arrangements	Increase Harvestable Rights	Licenced capture of water in farm dams via high flow LTAAEL plus improved trading <sup>194</sup>
<i>(g) provide water allocation account management rules which allow sufficient flexibility to encourage responsible use of available water</i>	<p>flow being set at the 50<sup>th</sup> percentile, which represents a medium level flow</p> <p>Currently the LTAAEL includes harvestable rights</p> <p>Limited trade due to restrictions and limited uptake of current high flow conversion policy</p>	<p>No need for any reassessment of current trade provisions.</p> <p>Increasing harvestable rights within the LTAAEL will reduce AWD's in the unregulated system.</p>	<p>(flow percentile triggered will need to be determined)</p> <p>Requirement for reassessment of trade provisions.</p> <p>Utilises trade as the mechanism to shift water use behaviour.</p>
<i>(k) contribute to the maintenance of estuarine processes and habitats</i>	Trade currently restricted where there are environmentally sensitive assets.	Current modelling indicates some impacts on estuarine environments.	Managed allocation of access to high flows would enable mitigation of any impacts to estuarine environments and key environmental assets.
<i>(l) maintain a contribution of flows from upstream water sources to downstream water sources</i>	See discussion of objective (b) and (d)		

The Commission recognises that changes to harvestable rights policy may result in not only an increase in the volume of water captured at high flow, but also greater capture of water moving through the catchment during periods of low flow. One mechanism that may reduce the impact of capture of low flows is the construction of low flow bypasses (**Figure 11**). Studies have indicated that low flow bypasses do not impact on the security and ability to access water by landholders, whilst preventing low flows from entering dams by diverting flows around dams and sending flows downstream.<sup>195</sup>

In NSW there is no policy stating a requirement for construction of low flow bypasses with farm dams, with approvals and consents based around local planning regulations, harvestable rights orders, farm dam licencing and in some cases a requirement for fish passage.<sup>196</sup> The Commission recognises that any requirement for the installation of a low flow bypass would be a step away from current policies but may be warranted where there is pressure in catchments on low flows.<sup>197</sup> As highlighted in **Table 9**, there are considerable challenges in regulating requirements for farm dam infrastructure where this is associated with a harvestable rights, which are mitigated when a farm dam is licensed. Where take within a farm dam is licensed, conditions such as low flow bypasses can be placed on the works approval, ensuring that this is a requirement of construction of the farm dam that can be inspected for compliance in the future. This would ensure that capture of flows can be kept within the high flow band, whilst maintaining movement of low flows for other system users. The use of low flow bypasses may mitigate some, but not all of the impacts on flows identified in DPIE-Water modelling (**Section 5.3.1**). Similarly, as noted in earlier discussion, impacts will not equally apply across all south coast plan areas due to the differences in catchment size.



**Figure 11: Diagram of a dam with a low flow bypass<sup>198</sup>**

<sup>195</sup> South Australia Department of Natural Resources (2018) *How reduced flows of water affect catchment health*. Available at: [https://www.landscape.sa.gov.au/files/sharedassets/sa\\_murray-darling\\_basin/projects/flows\\_for\\_the\\_future/f4f-science-brochure-august-2018-bro.pdf](https://www.landscape.sa.gov.au/files/sharedassets/sa_murray-darling_basin/projects/flows_for_the_future/f4f-science-brochure-august-2018-bro.pdf).

<sup>196</sup> Water NSW (n.d.). Harvestable Rights – Dams. Available at: <https://www.waternsw.com.au/customer-service/water-licensing/blr/harvestable-rights-dams>

<sup>197</sup> The Commission recognises that low flow bypasses will not resolve impacts on fish passage and as such any impacts on key fish habitat resulting from impacts of farm dams will need to be considered separately

<sup>198</sup> Diagram taken from: South Australian Murray Darling Basin Natural Resource Management Board (2014) *Low Flow Bypasses Technical Factsheet 3A*. Available at: <http://www.naturalresources.sa.gov.au/files/bbc49000-300a-46d7-a648-a1b300ffef7a/waa-guidelines-low-flow-on-stream-fact.pdf>

The Commission understands that in order to facilitate access to larger volumes of water in high flows there would be a need to reconsider current trade arrangements within the Plans. Considerations for the review of trade arrangements are outlined below. It should also be noted that management of high flows as outlined would require a robust compliance regime including appropriate metering and monitoring.

## 5.4 Provisions may unnecessarily inhibit trade

License holders have raised concerns over the limitations created by trade rules, particularly in light of the limited water availability within the plan areas.

The Plans include objectives to provide opportunities for market-based trade, within environmental and system constraints.<sup>199</sup> To do this, the Plans include dealing rules<sup>200</sup> (hereafter referred to as trade rules), developed as part of the macro planning process<sup>201</sup> and in line with the *Access Licence Dealing Principles Order 2004*.<sup>202</sup>

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.<sup>203</sup>

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.

Trade rules aim to encourage the transfer of water to the highest value use, with various restrictions or considerations:

- The Order requires trade rules in all water sharing plans to meet environmental requirements,<sup>204</sup> and prevent adverse impacts on basic landholder rights and features of

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<sup>199</sup> Clause 10(f) of the Bega Brogo Plan, Clause 10(e) of the Murrumbidgee-Wallaga and Towamba plans is to 'provide opportunities for market based trading of access licences and water allocations within sustainability and system constraints'; Clause 10 of the *Access Licence Dealing Principles Order 2004* states 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.

<sup>200</sup> Part 10 of the Murrumbidgee-Wallaga Plan and Part 11 of the Bega Brogo and Towamba plans establish a system for licence dealings in the respective plan areas.

<sup>201</sup> 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](http://www.water.nsw.gov.au/__data/assets/pdf_file/0008/548153/macro_unreg_manual_web.pdf).

<sup>202</sup> NSW Government (2004) *Access Licence Dealing Principles Order 2004*. Available at:  
<https://www.legislation.nsw.gov.au/view/whole/html/inforce/current/sl-2004-0433>.

<sup>203</sup> The Bega Brogo Plan has two extraction management units, 12 water sources and four management zones. The Murrumbidgee-Wallaga Plan has one extraction management unit, 13 water sources and no management zones. The Towamba Plan has three extraction management units, 22 water sources and no management zones.

<sup>204</sup> 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.

major cultural, heritage or spiritual significance.<sup>205</sup> Trade is also restricted by the Order between non hydrologically connected systems.<sup>206</sup>

- Trade rules in all Plans are based on ecological value and hydrologic stress at low flow, with trade prohibited into water sources with high instream values and high hydrological stress (see **Appendix A**).
- Under the Bega Brogo Plan, trade is prohibited between regulated and unregulated systems or between unregulated water sources. The Commission notes that this level of trade restriction is unusual as most unregulated plans allow some trade between water sources. It is understood that these restrictions were put in place due to the high level of entitlement on issue on small streams. Trade restrictions aimed to avoid further concentration and pressure on water sources.

The macro approach was modified for the Murrumbidgee Plan since the periods of low flow were significant. The Commission reviewed trade data provided by WaterNSW, which indicated that there is limited trade within the plan areas.<sup>207</sup> While it is not an objective to maximise the number of trades, limited trade may indicate that provisions are not designed to meet trade objectives.

The Commission identified several opportunities that may improve trade, many of which have also been found in previous plan reviews:

- **Reviewing the scale of management to better support the water market, including:**
  - **the scale of water sources** – Due to the high level of low flow hydrological stress trading is currently limited to within water sources subject to assessment and restrictions on trading between certain management zones. Stakeholders consider the small size of water sources a barrier to trade, particularly in the Towamba Plan area, as the low number of buyers and sellers in each water source makes trading opportunities scarce. In the Towamba Plan area, WaterNSW indicated that water sources may need to be combined to better reflect the appropriate scale of management, as the current number of water sources within the Plan was high given its area: *‘Towamba is a small plan area, but there are 22 water sources covered by the Plan. There are 77 unregulated water access licence holders with 19 aquifer access licences holders. Trading between water sources is limited by the plan. Water sources need to be rationalised to support trade. This is not just an issue for Towamba, it is a common thread across a number of plans’*. The Commission recognises that combining water sources will be a resource intensive process; but is of the view that it is a valuable step that should be undertaken as part of Plan remake.

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<sup>205</sup> 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. (NSW Government (2004) *Access Licence Dealing Principles Order 2004*. Available at: [https://www.legislation.nsw.gov.au/~/\\_/view/regulation/2004/433/full](https://www.legislation.nsw.gov.au/~/_/view/regulation/2004/433/full)).

<sup>206</sup> The Commission notes that potential trades between non-hydrologically connected systems is only being considered for the coastal plans and is not being considered for the Murray Darling Basin plans. It is intended that this may be considered as a potential option to allow the flexibility to trade out of water sources with highly sensitive environmental assets in to highly impacted catchments. The Commission recognises that this represents a shift in current Departmental policy however it may provide the opportunity to achieve significantly improved environmental outcomes. A trade review that considers the outcomes of HEVAE mapping may provide the basis for where such trades can be permitted.

<sup>207</sup> WaterNSW (2020) *NSW Water Register*, accessed January 2020. Available at: <https://waterregister.waterrnsw.com.au/water-register-frame>.

- **between extraction management units and plans** – Some stakeholders also suggested trade should also be able to occur over larger areas, such as between catchments. The scale of water sources in South Coast Plans are small, this could include combining small water sources into larger trading areas within the plans or trading between Plans. The Commission notes the Access Licence Dealing Principles Order restricts trade between non-hydrologically connected systems (i.e. larger areas), and any changes would require an amendment to the Order. If trading within an extraction management unit occurs, no adjustment of LTAAEL is required. However, if trade were to occur between extraction management units, there would need to be an adjustment to the LTAAEL. For example, if licence holders wanted to trade between a Bega Brogo Plan water source and a Murrah-Wallaga Plan water source, the Plans would need to have an LTAAEL that is higher than the level of existing entitlements.

Trade restrictions in the Towamba and Murrah-Wallaga plan water sources are stringent because there is a high concentration of ICOLLs (see **Section 2.5**). Retaining adequate flows to ICOLLs is critical for achieving environmental outcomes of this plan and any changes to trade restrictions would require adequate consideration of the ICOLL requirements.

Water NSW also noted trading between the alluvial aquifer and the *Water Sharing Plan for the South Coast Groundwater Sources 2016*<sup>208</sup> area is currently prohibited and trade between these water sources would be beneficial if practical.

- **Improving trade opportunities at high flows** – While some trading is permitted between certain water sources within the same extraction management unit<sup>209</sup> (subject to additional assessments or restrictions), stakeholders raised concerns around the lack of flexibility to trade between water sources, particularly in the Bega Brogo Plan area. The Commission recognises that the restrictions on trading between water sources in the Bega Brogo Plan were designed to protect areas of high conservation value and low flows. These restrictions were considered necessary given the high level of entitlement and overcommitment of the system in low flow periods. However, some stakeholders consider that allowing trade across water sources as high flow licences could increase economic outcomes while protecting low flows: *'The flexibility to trade into other water sources, particularly as a high flow licence trade would enable us to generate an income from this licence entitlement'*.<sup>210</sup> The macro approach did not consider high flow trades without conversion factors and this issue has been highlighted in previous reviews. The Commission notes that additional gauging and monitoring may be required to facilitate high flow trades.
- **Simplifying administrative arrangements** – Stakeholders in previous plan reviews have consistently advised that the management of trades is difficult due to a lack of clarity in trade rules, which causes delays and unintended barriers to trade. Of provisions in these Plans, WaterNSW raised that *'trading is sometimes avoided because shares are too hard to find, there aren't enough to go around, and trade rules are so prohibitive and confusing that people don't bother.'*<sup>211</sup>

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<sup>208</sup> NSW Government (2016) *Water Sharing Plan for the South Coast Groundwater Sources 2016* Available at: <https://www.legislation.nsw.gov.au/view/html/inforce/current/sl-2016-0380>.

<sup>209</sup> Water access licences cannot be traded between extraction management units in coastal water sharing plans.

<sup>210</sup> Interview: WaterNSW, 29 July 2020.

<sup>211</sup> Interview: WaterNSW, 29 July 2020.

- **Improve trade information** – 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 in the Bega Brogo Plan area have no costs assigned, limiting the information available to the market to support growth.<sup>212</sup> WaterNSW has recently updated their trade application form to require the inclusion of costs, though cannot require costs to be accurately entered.<sup>213</sup>

Any actions to strengthen trade must protect environmental outcomes in line with the Act's water management principles. As discussed in previous reviews,<sup>214</sup> 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.

Recognising that many of these issues are state-wide, DPIE-Water advised that it is currently reviewing trade rules for unregulated rivers (coastal and inland). In developing the replacement Plans, DPIE-Water should draw on the findings of this work to determine the most appropriate scale for water sources and trading areas in the Plans. Provisions should be designed at the appropriate geographic scale and clearly stated in the Plan to support trade within environmental and system constraints. The Commission would support inclusion of updated trade rules in the south coast plans flowing from the DPIE-Water review where it demonstrated that this supports improved environmental, economic and social outcomes.<sup>215</sup> Links between the intended objectives, location of high economic and environmental values, and Plan provisions should be clearly communicated.

The Commission notes that DPIE-Water is updating its HEVAE mapping for the South Coast catchments in 2021. Mapping for the Towamba Plan area has already been completed, with additional water sources identified as having high or very high instream values.<sup>216</sup> Trade rules will need to be reviewed considering this assessment for the replacement Towamba Plan. Mapping for the Bega Brogo and Murrumbidgee plans should be completed prior to the replacement plans being developed to inform trade rules. DPIE-Water indicated it will use this

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<sup>212</sup> 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.

<sup>213</sup> WaterNSW (2020) *Water Allocation trade form update – fact sheet*. Available at: [https://www.watarnsw.com.au/\\_\\_data/assets/pdf\\_file/0008/158939/Water-Trade-Form-Update-Factsheet-FINAL.pdf](https://www.watarnsw.com.au/__data/assets/pdf_file/0008/158939/Water-Trade-Form-Update-Factsheet-FINAL.pdf)

<sup>214</sup> See previous commission reports at Natural Resources Commission (2021) *Water Sharing Plan Reviews*. Available at: <https://www.nrc.nsw.gov.au/wsp-reviews>.

<sup>215</sup> If the trade review is complete prior to south coast plan updates, revisions to trade rules should be included in the remade plan. Where this is not possible, amendment provisions may be required to facilitate inclusion of trade rule updates during the life of the new plan.

<sup>216</sup> In 2011 the Towamba Plan identified eight water sources with high instream values, which have no extraction entitlement and trading into these water sources was restricted. DPIE-Water recently updated its HEVAE mapping for the Towamba Plan area with 10 water sources classified as high conservation value and six water sources classified as very high conservation value (note the HEVAE methodology has changed since plan commencement, now using high and very high classifications).

information alongside the latest metrics on hydrological stress to assess water source risk and review trade rules. This is an important step to ensure any revisions to trade rules to identify potential perverse or unintended outcomes and protect high value ecosystems.

In reviewing the trade rules, DPIE-Water should review where flexibility in trade provisions can be made, without impacting on environmental outcomes. Initial findings point towards flexibility of trade in the south coast plans that focus trade into highly impacted water sources and out of water sources with high environmental values. Allowing for this trade may free up licenced entitlement for the capture of high flows in farm dams.

## 5.5 Recommendations

<p><b>R4 - Bega Brogo</b></p>	<p>By 1 July 2023, to reduce pressure on low flows and enhance economic opportunities, DPIE-Water should:</p> <ul style="list-style-type: none"> <li>a) investigate the feasibility of setting a high flow LTAAELs as a component of overall LTAAEL</li> <li>b) undertake further modelling to investigate the potential for increased access to high flow runoff via licensed farm dams to be used as tool to shift water users out of extraction of low flows within the Bega Brogo Plan area. Modelling or further analysis should consider the impact of: <ul style="list-style-type: none"> <li>- excluding extraction at low flows under the assumption of users migrating to diversion of high flows</li> <li>- benefits and costs of implementation of low flow bypasses on dam infrastructure</li> <li>- proposed changes on end of system flows and flow requirements for the protection of environmental assets</li> </ul> </li> <li>c) determine the metering and monitoring requirements that would be needed to implement high flow access options and assess their feasibility.</li> </ul>
<p><b>R 5 - All Plans</b></p>	<p>By 1 July 2023, DPIE-Water should complete their review of trade for coastal catchments and review and address trade barriers for these plans, including but not limited to options to combine water sources and increase flexibility to trade into high flows. Any changes to trade rules should maintain protections for high-value aquatic ecosystems and cultural values, including considering latest HEVAE mapping and risk assessments.</p>

## 6 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.<sup>217</sup>

The Plans have several provisions designed to protect environmental values, including:

- management of extraction against the LTAAEL (**See Section 4**)
- first flush rules
- cease to pump restrictions – implementation of gauged flows or visible flow restrictions according to the availability of river or creek gauging
- total daily extraction limits (TDELS)
- high flow conversions
- trade restrictions on licences (**Section 5.4**).

The ability to assess the effectiveness of the environmental provisions was limited by a lack of monitoring. However, the Commission found several opportunities to strengthen environmental provisions in the Plans, including:

- improving monitoring of risks to priority threatened species and endangered ecological communities and ensuring the Plans protect these assets (**Section 6.1 and 6.2**)
- continuing work to maintain good estuarine condition by determining environmental water needs and risks to estuaries and designing objectives and provisions to address these (**Section 6.3**)
- reviewing low flow protections to ensure they remain fit for purpose (**Section 5.3**), including investigating the potential for targeted increases in extraction of high flows to shift extraction from low to high flows (**Section 6.1 and 6.2**)
- improving the management of connectivity by more effectively protecting highly connected surface-groundwater systems, drawing on best available information and additional studies where appropriate (**Section 6.4**)
- strengthening the protections for GDEs (**Section 6.5**)
- reviewing the adequacy of environmental flow and drought reserve provisions for Cochrane Dam (**Section 6.6**).
- reviewing how the response to environmental impacts of bushfires can be better considered within the plan rules (**Section 6.7**).

### 6.1 Protection of low flows should be reviewed

As outlined in **Section 5.1**, there remains significant pressure on low flows. In addition to efforts to move usage to high flows, the south coast plans include cease to pump rules and TDELS to manage hydrologic stress during low flow periods.<sup>218</sup> The current cease to pump rules

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<sup>217</sup> As per the water management principles, Section 5(3a) of the Act.

<sup>218</sup> These are outlined in the Bega Brogo Plan (CTPs: Div 3, Clause 64; TDELS: Div 3, Clause 68-69), Murrah Wallaga Plan (CTPs: Div 2, Clause 39); Towamba Plan (CTPs: Div 2, Clause 40; TDELS: Div 2, Clause 43-44)



in the Bega Brogo Plan are based on previous rules developed by the South Coast Water Management Committee, with some changes.<sup>219</sup> When the Plans commenced, the Interagency Regional Panel retained the CTP rules developed by the Healthy Rivers Commission and the South Coast Water Management Committee.<sup>220</sup> As outlined previously, flow rules to manage water for the environment were in place prior to the commencement of the south coast plans, and at the time were recognised as a significant step by the south coast communities to manage water for environmental purposes. The rules to manage extraction pressure at low flow periods for the Towamba and Murrah-Wallaga Plans were based on existing informal water sharing arrangements in place prior to the formal water sharing plans (see **Section 2.2.1** and **2.3.1**).

The Bega Brogo CTP Plan rules put in place by the Healthy Rivers Commission and the South Coast Water Management Committee were principally focused on protecting low flows to provide protection of refuge pools. At the time of the Healthy Rivers Commission report it was noted that while there was information on low flow records for many of the waterways throughout the Bega catchment, there was limited information on water use and environmental impacts of reduced flows. The Commission notes that these gaps in information remain at the present time, with an absence of reporting against the MER framework or any monitoring of river condition. The lack of reporting against Plan performance indicators, gaps in calculation of extraction, assessment and compliance with LTAAEL and updating of water access licences to enforce Plan flow rules have been identified under the audit process as issues to be resolved across the Plans.<sup>221</sup>

The Commission notes that there will continue to be issues with the assessment of volumes of extraction, until the metering program is rolled out across the south coast plan area. For coastal water users the non-urban metering rules will commence on 1 December 2023.<sup>222</sup> As advised by DPIE-Water the roll out of metering will be limited to pumps greater than 100 mm for surface water extraction and bores greater than 200 mm.

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<sup>219</sup> Changes were made to ensure compliance with the Act and National Water Initiative, improve operational compliance, align with state-wide policies and ensure consistent terminology across water sharing plans.

<sup>220</sup> The Bega-Bemboka Flow Plan was supported by the Healthy Rivers Commission and recognised as a significant step towards protecting local river health. The restrictions identified within the Healthy Rivers Commission report were carried through to the CTP very low flow class for the Bega Brogo Plan. The Bega-Bemboka Flow Plan aimed to maintain streamflow to Kanoona Rocks by preserving an equivalent 95<sup>th</sup> percentile January flow, that increased restrictions on extraction below the 80<sup>th</sup> percentile flow. The Healthy Rivers Commission considered that these restrictions preserved the low flows required to provide habitat connection. Recognising that the Bega-Bemboka Flow Plan did not cover the full extent of the Bega Brogo Plan area the Healthy Rivers Commission developed additional rules to restrict extraction on rivers and creeks outside the flow plan area. The main purpose of protection of environmental flows in the Healthy Rivers Commission report were to preserve low flows to protect refuge pools whilst maintaining some freshes and higher flows to allow for a 're-set' of the riverine and wetland ecosystems. Healthy Rivers Commission (2000). *Independent Inquiry into the Bega River System - Final Report*.

<sup>221</sup> Alluvium (2019) *Audit of the Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources 2011; Audit of the Water Sharing Plan for the Towamba River Unregulated and Alluvial Water Sources 2010; Audit of the Water Sharing Plan for the Murrah-Wallaga Area Unregulated and Alluvial Water Sources 2010*. Available at: [https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0008/289475/Bega-and-Brogo-Rivers-Area-Regulated,-Unregulated-and-Alluvial-Water-Sources-2011.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0008/289475/Bega-and-Brogo-Rivers-Area-Regulated,-Unregulated-and-Alluvial-Water-Sources-2011.pdf); [https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0009/289503/Towamba-River-Unregulated-and-Alluvial-Water-Sources-2010.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0009/289503/Towamba-River-Unregulated-and-Alluvial-Water-Sources-2010.pdf); [https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0010/289486/Murrah-Wallaga-Area-Unregulated-and-Alluvial-Water-Sources-2010.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0010/289486/Murrah-Wallaga-Area-Unregulated-and-Alluvial-Water-Sources-2010.pdf).

<sup>222</sup> DPIE-Water (n.d.) New reporting rules for metered water users. Available at: <https://www.industry.nsw.gov.au/water/metering/new-reporting-rules>

To determine restrictions on licences to preserve environmental flows in the absence of additional information, the Healthy Rivers Commission used expert panels, hydrographic data, estimate of water extraction and economic modelling to determine approximations of environmental flow needs and subsequent licence restrictions. This accompanied the restrictions on extraction proposed under the Bega-Bemboka Flow Plan and endorsed by the Healthy Rivers Commission. The Commission has not seen any evidence beyond these plans and reports that have allowed for any assessment of the ongoing adequacy of these rules to meet the intended environmental outcomes, including maintenance of river connectivity.

The Commission notes that at the time of the Healthy Rivers Commission report there were no environmental releases from Brogo Dam, rules to maintain drought reserves for Cochrane Dam, or protection of first flushes. The introduction of the rules within the Bega-Brogo Plan is anticipated to have delivered some environmental benefit, although without monitoring the extent of this impact cannot be assessed. Further, whilst the Bega-Bemboka Flow Plan was in place prior to the introduction of the Bega Brogo Plan, similar restrictions on extraction did not apply across the Plan area. In these cases, the Bega Brogo Plan represents a step forward in protecting low flows.

The Commission has not seen any formal evidence of assessment of hydrographic data or estimates of extraction to provide any assessment of restrictions on extraction (e.g. CTPs and TDELS) for the Towamba and Murrah-Wallaga Plan areas.

The Commission notes that at the time of implementation of the south coast plans there was a recognised need to reduce pressure on low flow extraction, with high flow licence conversions used as the principle mechanism to drive a change in water user behaviour. Due to the lack of adoption of high flow conversion it is anticipated that this pressure on low flows is ongoing.

The rules suggested within the Healthy Rivers Commission Report and indeed the south coast plans are subject to adaptive management to ensure that environmental objectives are being achieved. In the absence of additional evidence the Commission cannot comment on the adequacy of plan rules or the ability of the Plans to manage future pressures on flow resulting from climate change. The adequacy of Plan rules in protecting low flows should be assessed following collation of monitoring data from priority monitoring sites (see **Table 10**) and the implementation of the non-urban metering rules, in conjunction with existing hydrographic information from the gauging network.

## **6.2 Assessment and monitoring of environmental assets could be improved**

The plan areas have several identified threatened species and endangered ecological communities that are sensitive to extraction. As identified in previous water sharing plan reviews undertaken by the Commission, there has been no monitoring or evaluation undertaken to determine whether plan provisions are protecting these environmental assets outside the estuaries. There is also limited external monitoring of these assets.

While the Commission typically seeks use available data to assess the adequacy of provisions of plans protecting environmental flows, such as cease to pump rules, the Commission has not been able to make such an assessment for these plans given the lack of information on the overall river health.

In remaking the plans DPIE-Water should investigate the environmental assets and flow needs of the plans and ensure that the plan provisions are suitably protective, noting the hierarchy of priorities under the Act.

In order to better assess the adequacy of provisions in the future, the MER frameworks for replacement Plans (see **Section 9**) should include strategies to assess the impacts of water sharing on threatened species and ecological communities. The Commission acknowledges that establishing an ongoing monitoring program can be costly. However, given the significance of the environmental assets across the South Coast, the pressure for change within the Plan regarding how water is extracted and used, and the potential for future impacts of climate change, some monitoring of condition will be essential. The Commission considers that monitoring condition as currently undertaken by DPIE-Water via the river condition index, will capture any changes to key indicators such as hydrologic stress, water quality, riparian vegetation and river biodiversity.<sup>223</sup>

Based on available evidence, the Commission has proposed some priority areas for monitoring by DPIE-Water, which could be used as a starting point to target MER (**Table 10**). The Commission notes that priority water sources should be revisited following planned updates to HEVAE mapping in the Murrah-Wallaga and Bega Brogo plan areas.

The Commission recognises the importance of a robust gauging network for river management. Assessment of the adequacy of the gauging network for the Bega Brogo Plan area was undertaken as part of the Healthy Rivers Commission Report, where it was recommended that gauging sites be established at Morans Crossing, Candelo damsite, Yurramie and Double Creek. Information available through the WaterNSW real time data network indicates that gauges are operational at all these sites with the exception of Yurramie.<sup>224</sup> As the Yurramie gauge is meant to monitor flows across the Candelo, Sandy and Wolumla Creeks it is envisaged that information derived via the Candelo and Kanoona gauges could be used for river management. The Commission understands that at the time of the Plan, management of the Bemboka-Bega stretch of the river was switched from dual gauge monitoring, across Moran's Crossing and Kanoona gauges, to the single gauge at Kanoona to allow for a whole of system monitoring and management. The Commission supports this approach. Further, there is an absence of any gauge on the Brogo-Bega regulated river, with the Kanoona gauge instead used as a surrogate to manage releases from Brogo Dam. The Commission supports establishment of a gauge at the end of the Brogo-Bega regulated system to more effectively manage system flows and releases.

The gauging network across the Towamba and Murrah-Wallaga Plan areas overlaps areas of high levels of extraction (see also **Table 10**) and as such the Commission does not propose any changes to the gauging network. In the event that there is progression of high flow extraction rules the adequacy of this gauging network may need to be reassessed.

Some stakeholders indicated that current river management practices to enable water sharing is impacting on fish populations. For example, the temporary sand barrage put in the Bega River at Jellat Jellat to limit saltwater intrusion and maintain extraction for stock water supply was

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<sup>223</sup> DPIE Water (n.d.). Inputs in to the NSW river condition index. Available at: <https://www.industry.nsw.gov.au/water/science/surface-water/monitoring/river-health/inputs-river-condition-index>

<sup>224</sup> Data available through the WaterNSW real time data network indicates that gauges are operational at the following sites Double Creek, North Brogo, Angledale, Brown Mountain, Tantawanglo, Candelo (Greenmount and damsite), Moran's Crossing and Kanoona. Available at: <https://realtimedata.waternsw.com.au/>

considered to be potentially impacting fish migration requirements.<sup>225</sup> The construction of dams and weirs that prevent migration has been identified as a key threat to Australian grayling, a key threatened species in the Plan areas.

The current Bega Brogo Plan allows for DPI-Fisheries to monitor fish distribution and population impacts associated with construction of the barrage. DPI-Fisheries advised that it is shortly to commence a fish and flows project in the South Coast region to assist in the determination of the flow requirements of freshwater and estuarine fish. This should consider the impacts of the temporary barrage on Australian grayling population and distribution. The installation of a temporary sand barrage to manage saltwater ingress may be insufficient to manage saltwater ingress associated with climate change (see also **Section 7.5**). Alternate solutions to a temporary barrage may be required in the longer term to meet the needs of extraction for stock water supply purposes.

**Table 10: Priority water sources for monitoring in the plan areas**

Plan	Water source	Justification
Bega Brogo Plan	Upper Bega / Bemboka Rivers	Significant extraction <sup>226</sup> overlays threatened species sensitive to extraction
	Bega and Brogo Rivers Regulated	Significant extraction <sup>227</sup> overlays threatened species sensitive to extraction
Murrah-Wallaga Plan	Murrah River	Significant extraction <sup>228</sup> overlays assets sensitive to extraction
Towamba Plan	Pambula Lake Tributaries	Significant extraction <sup>229</sup> overlays assets sensitive to extraction
	Towamba River	Acknowledge that this is part of the DPIE-EES estuary monitoring program, however as indicated in Table 1 this has not been sampled since 2008. The Towamba River was highlighted in the background document as an estuary subject to the impacts of extraction. Recommend that this be adopted as an estuary to be monitored on the three-year DPIE-EES rolling cycle or extended to a monitoring program that sits outside this structure.

<sup>225</sup> Interview: DPI-Fisheries, 18 November 2020; Bega Environment Network, 3 February 2021.

<sup>226</sup> Licenced entitlement is 9,557 unit shares which represents approximately 20% of all entitlement on issue in the Bega Brogo Plan. The Upper Bega / Bemboka Rivers overlays threatened species identified as extraction sensitive (see Appendix D).

<sup>227</sup> Licenced entitlement is 16,374 unit shares which represents 35% of all entitlement on issue in the Bega Brogo Plan. The Bega and Brogo Rivers overlays threatened species sensitive to extraction (see Appendix D).

<sup>228</sup> Extraction from Dry River and Murrah River is 1,953 ML/year which represents 17.4 per cent of the mean annual stream flow of 11,202 ML. Taken from (NSW Office of Water, 2010) Murrah Wallaga Background Document

<sup>229</sup> Extraction from Pambula Lake Tributaries is 907 ML per year which represents 7.0 percent of the mean annual stream flow of 12,756 ML. Taken from (Office of Water (2011) *Water Sharing Plan for the Towamba River Unregulated and Alluvial Water Sources – Background document*. Available at: [http://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0009/549198/wsp\\_towamba\\_river\\_background.pdf](http://www.water.nsw.gov.au/__data/assets/pdf_file/0009/549198/wsp_towamba_river_background.pdf))

### 6.3 Work to maintain good estuarine condition should continue

Estuaries are key environmental assets, linking land, freshwater and marine habitats,<sup>230</sup> supporting a diversity of species and filtering pollutants such as pesticides, herbicides and heavy metals.<sup>231</sup> Over 70 percent of coastal fish species in NSW use estuaries during their life cycle, many of which support commercial or recreational fishing industries.<sup>232</sup> Estuaries also support a range of other cultural, recreational and economic values. In NSW, commercial fishing and recreational fishing around estuaries is worth over \$80 million and \$500 million per year, respectively.<sup>233</sup>

Although there is limited plan-specific data on the extent to which plan provisions are protecting estuary condition, the condition of most estuaries in the plan areas is monitored (as chlorophyll concentration and turbidity<sup>234</sup>) by DPIE-EES through the NSW Estuary Monitoring Program. Additional monitoring is also undertaken by Bega Valley Shire Council<sup>235</sup> and the NSW Food Authority (for oyster production). The Commission has used this data to infer overall estuarine health.

Based on data provided by DPIE-EES, estuaries in the plan areas are in good condition. Assessed against compliance with trigger values, most estuaries in the plan areas score as 'very good' (equivalent to the best 20 percent of scores in the State, indicators meet almost all benchmark values all of the time) or 'good' (indicators meet almost all benchmark values most of the time and any exceedances are small).<sup>236</sup>

The good condition of south coast estuaries is acknowledged by stakeholders.<sup>237</sup> However, as the estuaries typically draw from small catchment areas, stakeholders noted that it would not take a significant change in inputs to impact current estuary health:

*'The intermittent lagoons are incredibly vulnerable to being degraded. In general, most of them aren't [degraded], they are in reasonably good condition. But it doesn't take much to degrade them.'*<sup>238</sup>

<sup>230</sup> Gillanders, B.M., Elsdon, T.S., Halliday, I.A., Jenkins, G.P., Robins, J.B. and Valesini, F.J. (2011) 'Potential effects of climate change on Australian estuaries and fish utilising estuaries: a review', *Marine and Freshwater Research*, 62(9), pp. 1115-1131.

<sup>231</sup> DPIE-EES (2018) *Why estuaries are important*. Available at: <https://www.environment.nsw.gov.au/topics/water/estuaries/about-estuaries/why-estuaries-are-important>.

<sup>232</sup> Dominguez, G., Bishop, M., Heimhuber, V., Glamore, W., Scanes, P. (2019) 'Module 4 – Ecological responses to climate change' in *Climate change in estuaries – State of the science and framework for assessment 2019*. Available at: <https://estuaries.unsw.edu.au/climatechange>

<sup>233</sup> DPIE-EES (2018) *Why estuaries are important*. <https://www.environment.nsw.gov.au/topics/water/estuaries/about-estuaries/why-estuaries-are-important>.

<sup>234</sup> Chlorophyll concentration monitors system response to input of nutrients and turbidity monitors system response to input of sediment

<sup>235</sup> Bega Valley Shire Council advised that monitoring has been undertaken historically, with additional work to occur following the 2019-20 bushfires.

<sup>236</sup> Trigger values have been established by calculating the 80<sup>th</sup> percentile of all data for reference estuaries in each estuary type as recommended by ANZECC and ARMCANZ guidelines; Note there are several estuaries in the plan areas that have not had ongoing monitoring of changes in estuarine condition. However, of these, only Middle Lagoon and Merimbula Lake are subject to medium levels of catchment disturbance, which is a key risk factor that may impact on estuarine condition. As such, it is anticipated that condition scores in the remaining estuaries would remain relatively stable and be consistent with the quality gradings of other estuaries in the region.

<sup>237</sup> Interviews: DPIE-EES, 15 December 2020; WRL, 11 February 2021.

<sup>238</sup> Interview: DPIE-EES, 15 December 2020.

*'Yes, they are in comparatively good condition as the population pressures are relatively low. Also, many estuaries have oysters in them, and oyster farmers are strong advocates for clean water as oysters need good estuary health to grow and survive.<sup>239</sup> However, it doesn't take much (like population increases) to influence these systems – a boom will mean people will need more water and this may affect the health of the estuaries. We have seen that people are already starting to move to the south coast as working remotely becomes more popular. These pressures need to be monitored carefully'.<sup>240</sup>*

Key risks to estuary health in the South Coast region include:

- human sewage – on-site sewage management system outflows are regularly inspected in high risk systems by Bega Valley Shire Council
- artificial opening of estuarine entrances
- sediment and nutrient loads moving off the catchment into estuaries due to poor catchment and riparian condition<sup>241</sup>
- modified freshwater flows.<sup>242</sup>

While estuaries are currently in good condition, it's critical that the Plans ensure there are sufficient flows to facilitate natural estuary filling, foreshore inundation, and estuarine opening; and to maintain water quality going forward. The Plans are atypical, but should be commended, in that they have adopted a 'source to sea' approach and include estuaries in the plan boundaries. This differs from most other NSW coastal water sharing plans, which generally stop at the tidal or mangrove limit of the estuary. Including estuaries in the plan boundaries is considered best practice, as it allows for the impacts of catchment activities on estuaries to be considered and the development of water management strategies to meet the requirements of downstream environmental assets. It also allows for the consideration of climate change risks, for example the impact of saltwater ingress on freshwater river systems.<sup>243</sup>

The Commission notes that the current Plans have rules in place to reduce pressure on estuaries including:

- prohibition of dams on third order streams<sup>244</sup>
- trade rules (see **Section 5.4**)

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<sup>239</sup> It is understood that oysters will grow in poor water quality however in will not be marketable due to not meeting the relevant food safety standards. DPIE-EES, Pers comm, 23 April 2021.

<sup>240</sup> Interview: WRL, 11 February 2021.

<sup>241</sup> Interview: Bega Environmental Network, 3 February 2021; DPI Fisheries and NSW Food Authority, Personal communication, 17 February 2021.

<sup>242</sup> Estuary entrance modification and modified freshwater flow were identified in the NSW Marine Estate Management Authority Threat and Risk Assessment Report as high priority threats to estuaries in the southern region. See Table 3-5 of the 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](https://www.marine.nsw.gov.au/__data/assets/pdf_file/0010/736921/NSW-Marine-Estate-Threat-and-Risk-Assessment-Final-Report.pdf)

<sup>243</sup> Mathews, R. E., Tengberg, A., Sjödin, J., & Liss-Lymer, B. (2019) *Implementing the source-to-sea approach: A guide for practitioners*. Available at: <https://www.siwi.org/publications/implementing-the-source-to-sea-approach-a-guide-for-practitioners/>.

<sup>244</sup> Dams on third order streams are currently restricted in the Bega River Estuary and Tributaries Water Source and the Upper Brogo River Water Source (Clause 72(1) of the Bega Brogo water sharing plan); across the Murrumbidgee Plan except in the Dignams Creek Water Source, Dry River Water Source and the Narira Creek Water Source (Clause 45(1) of the Murrumbidgee water sharing plan); across the entire plan area of the Towamba water sharing plan (Clause 47(1)).

While some work was done during Plan development to determine estuary sensitivity to flows and extraction, more work is needed to determine the environmental water needs and risks to estuaries. The replacement Plans should continue to apply a 'source to sea' approach and ensure there are provisions to maintain estuary condition, including clear flow objectives and requirements for estuaries across the plan areas. This includes consideration of current Plan access rules such as CTPs in ICOLL catchments to ensure that estuarine flows are maintained. Estuarine flow objectives should consider the full range of values supported in the system, including ecosystem requirements and recreational and commercial fish ecology. The Commission continues to support restrictions on trade into ICOLL catchments and continuation of prohibition on dams on third order streams in ICOLL catchments to reduce any further hydrological pressure. The Commission supports measures that allow trade out of ICOLL catchments.

The NSW Government has previously identified the following key principles that should inform the replacement Plans:

- *'Coastal catchments must be considered and managed as whole systems that extend from the upper catchment down to the offshore waters.'*<sup>245</sup>
- *'Water management decisions should recognise that freshwater inflows are an essential requirement for the maintenance of estuarine and coastal ecosystems.'*<sup>246</sup>
- *'River flows should be managed so that a sufficient share of the total freshwater in a catchment is protected as inflows to estuaries to maintain and protect the biophysical processes and biodiversity of estuarine and coastal ecosystems.'*<sup>247</sup>

DPIE-Water should leverage data available through the DPIE-EES estuarine monitoring program and NSW Food Authority to monitor estuarine condition and identify early any changes to estuarine condition that may be impacted by the Plans.<sup>248</sup> This data should be used to adjust plan provisions as necessary to ensure that there is sufficient planned environmental water to respond to the needs of these estuaries.

This data is only indicative of where there may be issues with plan provisions impacting estuarine condition, given there are factors that impact estuary condition beyond the scope of the Plans, particularly catchments and riparian condition. The Commission acknowledges that there has been extensive work to improve riparian systems and reduce sediment and nutrient loads into estuaries through the Bega Environmental Management Program (BEMS) and South Coast Oyster Partnership Program (**Box 2**). The Commission also recognises that there are additional riparian revegetation and fencing works being undertaken as part of the implementation of the Marine Estate Management Strategy.<sup>249</sup> During stakeholder consultation,

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<sup>245</sup> Principle 1 in NSW Government (n.d.) *No. 10 Freshwater flows to estuaries and coastal waters: Advice to Water Management Committees*. Available at: [http://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0005/548024/policy\\_advice\\_10-flows.pdf](http://www.water.nsw.gov.au/__data/assets/pdf_file/0005/548024/policy_advice_10-flows.pdf).

<sup>246</sup> Principle 2 in *Ibid.*

<sup>247</sup> Principle 4 in *Ibid.*

<sup>248</sup> The Commission recognises that this data does not capture a biological component such as fish distribution and population. This represents a potential gap in the dataset, however to ensure ongoing monitoring of estuarine condition the Commission supports utilisation of existing datasets. The Commission would support monitoring of fish distribution and population at intervals to track any changes in fish populations given the importance of these estuaries for recreational and commercial fisheries purposes.

<sup>249</sup> Additional details on the Marine Estate Management Strategy, and in particular the riparian revegetation and fencing works being undertaken in coastal catchments are available at: <https://www.marine.nsw.gov.au/strategy-implementation/water-quality-and-litter>. The Commission

the Commission observed a high level of stakeholder collaboration across Government and industries through these programs.

In addition to developing robust plan provisions, programs supporting riparian management should continue to be supported. Maintaining riparian health is important to limit movement of sediment into rivers and on to estuarine systems. This is particularly critical following bushfires, where the loss of groundcover and subsequent rainfall results in significant erosion and sediment movement. The Commission notes that, due to the severity of the recent bushfires, fire impacted the catchment to the border of the estuary in some parts of the system.

## Box 2: Riparian improvement programs in the South Coast region

### Bega Environmental Management Program<sup>250</sup>

The Bega Environmental Management Program is a partnership between South East Local Land Services and Bega Cheese aiming to improve environmental performance and sustainability outcomes for the far South Coast dairy industry. The project initially focused on biodiversity, effluent management, nutrient management and water use efficiency. Approximately \$7.3 million in grant funds have been leveraged, with \$10 million in landholder funds to:

- install 261 kilometres of fencing protecting 405 hectares of streambank, 333 hectares of remnant vegetation and 73 wetlands
- revegetate 274 hectares of riparian and wetland areas and 120 hectares of terrestrial area
- upgrade 28 dairy laneway and 23 stream crossings to prevent around 4,000 tonnes of sediment entering waterways
- remediate 40 priority erosion sites
- upgrade 53 effluent systems
- improve irrigation infrastructure at 35 sites (soil moisture probes)
- achieve 100 percent installation of irrigation pump meters along the Bega and Bemboka rivers
- achieve 95 percent engagement of all Bega and Eurobodalla dairy farmers
- host 150 extension and training events.

Following success of the program, it has been since rolled out to 350 dairy farms in NSW and Victoria and expanded its focus to cover energy efficiency, work health and safety, animal welfare and waste management.

### South Coast Oyster Partnership Program<sup>251</sup>

The South Coast Oysters Partnerships Program is a multi-stakeholder program involving industry (such as dairy, oyster farmers, graziers), LALCs; non-government organisations (such as Oceanwatch Australia), NSW Government agencies (DPI – Fisheries, Local Land Services), industry regulators (NSW Food Authority), private landholders, regional training organisations, and local communities (such as schools and community groups). It was established in the south coast following success of a similar program in the Clyde River.

The Program aims to:

- identify risks to estuaries and implement mitigation actions

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understands that DPI-EES and DPI-Fisheries are undertaking activities to monitor ecosystem health and water quality following completion of these works.

<sup>250</sup> Information based on internal documents provided by Bega Cheese.

<sup>251</sup> Giezelt, A. Keating, J. Davies, H. (2014) *Oysters – an ‘aphrodisiac’ for engaging industry and coastal communities in sustainable estuary management*. Paper presented at the 2014 Coastal Conference.



- encourage uptake of environmental sustainability and best practice across industries
- establish a program for working with other stakeholders and communities
- facilitate industry marketing of 'green' credentials.

Currently, all major oyster producing estuaries across the south coast operate under a formal environmental management system, which has not been achieved in any other Australian region or internationally.

Investment has been over \$1.5 million of NSW and Australian government-leveraged funding that has supported on-ground catchment works, best management practices for industry and community engagement activities. Achievements include:

- 8.7 kilometres of fencing to rehabilitate streambanks and protect riparian native vegetation
- sediment control works to manage drainage and sediment and erosion control at two high priority sites on the Pambula Lake foreshore
- upgrade of toilet facilities in public areas adjacent to waterways
- upgrades to oyster lease equipment to remove equipment that leach toxins into waterways from 27 hectares of lease area and removal of 230 tonnes of land-based waste from oyster depots
- improvement of 52 hectares of native vegetation, including 35 hectares of endangered ecological communities
- successful community planting and education outreach days.

## 6.4 Management of connectivity can be improved

### 6.4.1 Clear definitions of connectivity are required

The Plans consider connectivity between surface water and groundwater sources to some extent. The Murrah-Wallaga and Towamba plans are based on the principles of the macro water planning approach, which recognise that most alluvial groundwater sources are connected with associated surface water sources and should be covered by a single water sharing plan.<sup>252</sup> The Bega Brogo Plan was not developed using the macro approach, but the Interagency Regional Panel considered that provisions were consistent with indicative cease to pump rules from the macro approach and did not revise them.<sup>253</sup> In addition, the Plans included an objective consistent with the *National Water Initiative 2004* that '*provides recognition of the connectivity between surface water and groundwater*'.<sup>254</sup>

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.

<sup>252</sup> 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](https://www.water.nsw.gov.au/__data/assets/pdf_file/0019/547300/macro-water-sharing-plans-the-approach-for-groundwater.pdf).

<sup>253</sup> Office of Water (2011) *Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources – Background document*. Available at: [http://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0006/547287/wsp\\_bega\\_background.pdf](http://www.water.nsw.gov.au/__data/assets/pdf_file/0006/547287/wsp_bega_background.pdf).

<sup>254</sup> Clause 10(j) in the Bega Brogo Plan and Clause 10(h) in the Murrah-Wallaga and Towamba plans.

To advance the protection of surface-groundwater connectivity the provisions for protection of high priority GDEs should also require consideration of surface groundwater connectivity in the alluvial systems.

#### 6.4.2 More information is needed to understand and manage connectivity

When the Plans were developed, the level of connectivity between surface water and groundwater from different aquifer types was assessed. The coastal sands and upriver alluvial aquifers in the Plan areas were determined to have significant connection.<sup>255</sup> However, knowledge gaps and a lack of monitoring meant confidence in these assessments was limited. As such, connectivity may be underrepresented for some aquifer types that could potentially contribute to river base flow. The Plans have provisions to update connectivity based on outcomes of further studies of groundwater ecosystem dependency<sup>256</sup> but there is no evidence of changes to Plans resulting from improved understanding of groundwater ecosystems. Further, amendments in relation to connectivity only pertain to water supply works clauses and should allow for amendments to all connectivity provisions.

One of the original objectives of the Bega Brogo Plan was to maintain a contribution of flow from the Bemboka Water Source to the downstream water source.<sup>257</sup> To achieve this, Total Daily Extraction Limits (TDELs) were set to allow for that connectivity. Downstream of Kanoona in the Mid Bega River Sands Water Source, the TDEL is used to manage both the inflow from the Bemboka Water Source and subsurface extraction from bores. Setting the flow classes upstream and downstream on the same trigger at Kanoona requires all users to change classes at the same time.<sup>258</sup> Management of connectivity in this manner is good practice and should be maintained in the replacement Bega Brogo Plan. Since rainfall also contributes to the groundwater levels, the TDELs for belowground extraction were based on rainfall recharge of 2 ML per day.<sup>259</sup>

While the Plans include sound tools for managing connectivity, they can further improve the management of connected water sources (particularly Mid-Bega River Sands Water Source) and include a clear definition of surface-groundwater connectivity. The management of connectivity should be considered in light of projected impacts of climate change and the frequency of low flows, which may affect groundwater levels and potentially increase demand on groundwater (See Section 6 and 7).

Current surface water access rules (including cease to pump rules) in the Plans also apply to alluvial bores within 40 metres of the high bank of a river.<sup>260</sup> 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 with potential for these bores to impact on streamflow. Further, the rules for bores within 40 metres of the high bank of the river only apply to extraction from alluvial aquifers from Year 6 of the plan

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<sup>255</sup> Office of Water (2011) *Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources – Background document*. Available at: [http://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0006/547287/wsp\\_bega\\_background.pdf](http://www.water.nsw.gov.au/__data/assets/pdf_file/0006/547287/wsp_bega_background.pdf); Clause 26 of the Murrah-Wallaga and Towamba plans.

<sup>256</sup> Clause 96 c(ii) of the Bega Brogo Plan, Clause 66 c(ii) of the Murrah-Wallaga Plan, Clause 67 c(ii) of the Towamba Plan.

<sup>257</sup> Office of Water (2011) *Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources – Background document*. Available at: [http://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0006/547287/wsp\\_bega\\_background.pdf](http://www.water.nsw.gov.au/__data/assets/pdf_file/0006/547287/wsp_bega_background.pdf).

<sup>258</sup> *Ibid*

<sup>259</sup> *Ibid*

<sup>260</sup> Clause 78(1)(d) of the Bega Brogo Plan, Clause 41 of the Murrah Wallaga and Clause 42 of the Towamba Plan.

period for the Murrah-Wallaga and Towamba plans. Access rules were staged to manage the impact of stricter access rules.

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 through linked access rules. This is partly due 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 considered (as is the case for the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*).<sup>261</sup> In the case of the Bega Brogo Plan, TDELs and flow classes are used to manage connected water sources (particularly the Mid-Bega Sands Water Source). In the Murrah-Wallaga and Towamba plans, local conditions do not appear to have informed local rules for managing surface-groundwater connectivity.

The Plans also allow for conversion of unregulated river access licences to alluvial access licences,<sup>262</sup> potentially encouraging more extraction into the alluvial zone in areas that may be highly connected. Recognising the benefits of water users being able to 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 where appropriate.

In the Plans, most alluvial groundwater licences are found in the central river alluvium, with the Bega Brogo Plan having the most groundwater licences. Aquifer licences in the Bega Brogo Plan represent approximately two percent of total entitlement, with the highly connected Mid-Bega Sands holding approximately nine percent of total entitlement (See **Section 2.1**)<sup>263</sup>. They are mainly situated in the Mid-Bega Sands Water Source along the river, which is an important water source for town water supplies, Bega Cheese and surface and groundwater license holders.

The background document for the Murrah-Wallaga Plan states that there is 20 ML per year entitlement across four water sources, but also states that only two licences are in the alluvial aquifer. This may include estimations of domestic and stock use. There is no license data available on the Bureau of Meteorology Groundwater Explorer for the Murrah-Wallaga Plan area. The Towamba Plan records 1,730 unit shares of aquifer licenced entitlement (approximately 40 percent of total entitlement), including local water utility licences, which were using bores at Kiah as part of the bulk groundwater entitlement in the area.<sup>264</sup> The greatest volumes of water entitlement in the Towamba catchment are along the Towamba River and its tributaries, and in the Pambula Lake tributaries water source.

The presence of perched shallow aquifers is documented in the background documents, but is based on limited field data. Connectivity of these sources to either the fresh water supplies or the seawater intrusion is not documented and relies on 'salinity sensitive to freshwater inflows'

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<sup>261</sup> 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](https://www.water.nsw.gov.au/__data/assets/pdf_file/0019/547300/macro-water-sharing-plans-the-approach-for-groundwater.pdf).

<sup>262</sup> Clause 82 (2)(a) in Bega Brogo Plan, Clause 55(2) in Murrah Wallaga Plan and Clause 57 (3) in Towamba Plan.

<sup>263</sup> Entitlement by water source taken from data provided by WaterNSW from its Water Licensing System, 24 March 2021

<sup>264</sup> Aquifer licence entitlement taken from data provided by WaterNSW from its Water Licensing System, 24 March 2021

to dictate environmental flows.<sup>265</sup> A review of the extent of localised fresh groundwater sources is required to assess lateral interconnectivity and the presence of confining beds in the aquifers. Provisions should be updated to protect highly connected areas where appropriate.

In developing the replacement Plans, DPIE-Water should consider surface-groundwater studies and DPIE-EES soil landscape mapping to improve understanding of connectivity. Where appropriate, DPIE Water should prioritise connectivity studies based on the risks and values to surface water sources. For example, there are perceived risks to Mid River Bega Sands Water Source that warrant further investigation (see **Section 6.4.3**). Studies should also focus on areas with a relatively high density of bores (outside 40 metres) near water sources with high instream values.

Studies should inform a review of water access rules for areas that are identified as highly connected to ensure rules are consistently applied across connected surface and groundwater sources. In particular, 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 **Section 10**).

In developing MER programs for the Plans (see **Section 9**), metering and monitoring of extraction bores (including for domestic and stock) should be encouraged to develop accurate records of groundwater take and assessment against sustainable extraction limits. This information should be reported regularly and made publicly available.

### **6.4.3 Managing connectivity in the Mid River Bega Sands Water Source is critical**

The Mid Bega River Sands Water Source is the most-used aquifer in the Bega Valley. It is an important water source for town water supply, irrigation, domestic and stock use and dependent ecosystems. Current entitlement includes 3,998 unit shares which is predominantly comprised of unregulated river licences.<sup>266</sup>

Given its importance to water users, as well as known connectivity, the management of connectivity in the Mid Bega River Sands Water Source should be reviewed.

Until recently, water users and regulators considered the volume of water extracted from the Mid River Bega Sands Water Source to be a small fraction of that which is available. For this reason, the original Bega-Bemboka River Flow Plan (1999) did not include extraction rules for the Mid Bega River Sands Water Source. An isotope study completed in 2001 found the groundwater usage rate at the time was sustainable.<sup>267</sup> However, a 2004 study found that, while the volume of stored water in the alluvial aquifer in the Mid Bega River Sands was large

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<sup>265</sup> Office of Water (2011) *Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources – Background document*. Available at:

[http://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0006/547287/wsp\\_bega\\_background.pdf](http://www.water.nsw.gov.au/__data/assets/pdf_file/0006/547287/wsp_bega_background.pdf).

<sup>266</sup> Entitlement by water source taken from data provided by WaterNSW from its Water Licensing System, 24 March 2021

<sup>267</sup> Stone, D. Thomas, M. and Russell, G (2001) *Investigation of groundwater-streamflow interactions in the Bega alluvial aquifer using Tritium and Stable Isotope ratios*. ANA 2001, 4th Conference on Nuclear Science and Engineering in Australasia, pp 191-197, Sydney, NSW. Available at: [https://inis.iaea.org/collection/NCLCollectionStore/\\_Public/33/034/33034328.pdf?r=1&r=1](https://inis.iaea.org/collection/NCLCollectionStore/_Public/33/034/33034328.pdf?r=1&r=1)

(approximately 12,000 ML), through-flow limitations resulted in localised drawdown of groundwater.<sup>268</sup> This had implications for the security of town water supply as groundwater levels fell to minimum operating levels.

To manage this risk, the Bega Brogo Plan includes TDELS. TDELS are the total volume of water that may be extracted daily under access licences. The TDELS were included in the Bega Brogo Plan to manage both inflows and subsurface extraction from bores. They were considered necessary to limit extraction from alluvial sediments from bores adjacent to the river and allow for connectivity. Access increases (to an upper limit) as water level and stream flow increase. The assignment of TDELS was based on flow class in recognition of the connection of the aquifer with the river. However, the Plan's background document indicates that Bega Valley Shire Council's very low flow TDEL was based on averages (4 weeks in January and 2 weeks in other months) for operational flexibility and to mitigate impacts on other users.<sup>269</sup>

The Bega Valley Shire Council has commissioned a groundwater model for the Mid Bega River Sands aquifer that will consider a range of scenarios, including increasing the daily extraction limit to better understand any potential impacts that increasing daily extraction may have on the water source and other water users.<sup>270</sup>

TDELS appear to have been mostly effective at maintaining the groundwater level above minimum operating levels for town water supply (see **Section 7**). However, based on information provided by Bega Valley Shire Council, groundwater levels did fall below minimum operating levels.<sup>271</sup> TDELS should be retained in the Bega Brogo Plan and reviewed based on new understanding of recharge and throughflow and should prioritise protection of the water source and its dependent ecosystems in accordance with the Act.

#### **6.4.4 The management of connectivity between Plans should be resolved**

It is the understanding of the Commission that there is connectivity between adjacent alluvial systems in the Bega Brogo and Towamba Plans. Currently entitlement within the Towamba alluvial is 1,730 ML, the majority of which is held for town water supply, with restrictions on growth in entitlement.<sup>272</sup> The Bega Brogo Plan alluvial sources are similarly fully allocated.

WaterNSW staff interviewed for this review proposed that the alluvial provisions for the Towamba Plan should be moved to the *South Coast Groundwater Sources Plan 2016* to better support trade and clarify rules for groundwater works.<sup>273</sup> To determine the viability of this option the Commission reviewed the current LTAAEL for the South East Coastal Sands groundwater source in the *South Coast Groundwater Sources Plan 2016*, which covers the alluvial sands with a similar geographical footprint as the alluvial sands in the Bega Brogo and

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<sup>268</sup> Parsons Brinckerhoff (2004), *Bega Valley Alluvial Aquifer – Desktop Review of Groundwater Status*

<sup>269</sup> Office of Water (2011) *Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources – Background document*. Available at:  
[http://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0006/547287/wsp\\_bega\\_background.pdf](http://www.water.nsw.gov.au/__data/assets/pdf_file/0006/547287/wsp_bega_background.pdf).

<sup>269</sup> *Ibid*

<sup>270</sup> Interview: Bega Valley Shire Council, 23 October 2020.

<sup>271</sup> For example, on 2 February 2020 subsurface water levels fell to 5.2 metres at the Ranch monitoring bore (GWO39001).

<sup>272</sup> Entitlement is 1,400 ML for town water supply and 330 unit shares of aquifer entitlement. Data provided by WaterNSW from its Water Licensing System, provided 24 March 2021.

<sup>273</sup> Interview: Water NSW, 28 July 2020

Towamba Plans.<sup>274</sup> The South East Coastal Sands groundwater source LTAAEL is 5,600 ML/year. In contrast to the geographically distinct boundaries currently established in the Bega Brogo and Towamba Plans, the LTAAEL for the South East Coastal Sands, covers the non-contiguous coastal sands along much of the NSW coastline, an extensive geographical area.

It is the Commission's view that the South East Coastal Sands groundwater source LTAAEL lacks the resolution required to determine the feasible sustainable extraction levels for alluvial sands in the Bega Brogo and Towamba Plan areas. Given this, the Commission does not support any merger of the Bega Brogo and Towamba alluvial systems with *the South Coast Groundwater Sources Plan 2016*. Instead the Commission would support a merger of the relevant South East Coastal Sands water sources with the Bega Brogo or where relevant Towamba Plan, to allow extraction to be managed against a geographically defined LTAAEL that allows for the assessment of this distinct groundwater resource. In recognition of the connectivity of alluvial systems between the Bega Brogo and Towamba Plans, and in light of commentary from WaterNSW, DPIE-Water may wish to consider opportunities to support managing town water supply that is not reliant on trade between plans. This is further discussed in **Section 7.2**.

## 6.5 Protections for GDEs can improve

In line with plan objectives, the Plans have provisions to protect identified high priority GDEs.<sup>275</sup> Each Plan is required to include a schedule of identified GDEs.<sup>276</sup> When the plans commenced, no high priority GDEs were identified in the plan areas.

While no additional GDEs were added to the GDE registers during the plan period, there are several factors that justify a review of the presence of GDEs for protection as part of the development of the replacement Plans:

- Local and regional studies carried out as part of the National Water Commission Coastal Groundwater Quality and Groundwater Dependent Ecosystems Project have indicated that there is a high probability of GDEs<sup>277</sup> being found across all Plans, in the coastal alluvial, Murrah estuary tributaries alluvium, Murrah River groundwater sources.<sup>278</sup>
- The Bureau of Meteorology's Groundwater Dependent Ecosystems Atlas<sup>279</sup> indicates there are potentially high and moderate Type 2 (aquatic) GDEs, and moderate Type 3 (terrestrial) GDEs present in the Plan areas.

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<sup>274</sup> NSW Department of Primary Industries Water (2016). *Water Sharing Plan for the South Coast Groundwater Sources: Background document*. Available at: [https://www.dpi.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0003/660045/south-coast-groundwater-background-document.pdf](https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0003/660045/south-coast-groundwater-background-document.pdf)

<sup>275</sup> Objective 10(a) in the Murrah-Wallaga and Towamba plans and Objective 10(b) in the Bega Brogo Plan is to 'protect, preserve, maintain and enhance the important river flow dependent and high priority groundwater dependent ecosystems of these water sources'.

<sup>276</sup> Schedule 7 of the Bega Brogo Plan, Schedule 6 of the Murrah-Wallaga Plan and Schedule 5 of the Towamba Plan.

<sup>277</sup> The assessment of GDEs will be used to determine whether these are high or lower priority groundwater dependent ecosystems

<sup>278</sup> Reported in Williams, J.P., Kuginis, L., Serov, P. and Byrne, G. (2012) *Risk assessment guidelines for groundwater dependent ecosystems – Volume 2 – Worked examples for seven pilot coastal aquifers in NSW*; Serov, P., Kuginis, L. and Williams, J.P. (2012) *Risk assessment guidelines for groundwater dependent ecosystems, Volume 1 – The conceptual framework*; and Kuginis, L., Byrne, G., Serov, P. and Williams, J.P. (2012a) *Risk assessment guidelines for groundwater dependent ecosystems, Volume 3 and 4 – Identification of high probability groundwater dependent ecosystems on the coastal plains of NSW and their ecological value*.

<sup>279</sup> Available at: <http://www.bom.gov.au/water/groundwater/gde/>

- Mapping from the *Water Sharing Plan for the South Coast Groundwater Sources 2016* indicates that high priority GDEs currently managed under the groundwater plan may overlap with areas of the Plans covered in this review, and should be recognised in both if they fall within the Plan areas.
- There are ICOLs in the plan areas with associated coastal wetland areas that have the potential to be GDEs, particularly given the coastal wetland areas include swamps and wet meadows.<sup>280</sup> This is further supported by understanding of subtype classification of ICOLs in the south coast region that are recognised to have the highest occurrence of back dune lagoons and creeks. Back dune lagoons and creeks - ICOLL subtypes are characterised as having likely groundwater influence on their water balance.<sup>281</sup> The geology within the plan areas demonstrates significant overlap between the coastal plain alluvial aquifers, south east coastal sands and current mapping of the SEPP coastal wetlands, further indicating that most, if not all coastal wetlands are at least partially reliant on groundwater to maintain their water balance.<sup>282</sup>

As recommended in previous water sharing plan reviews,<sup>283</sup> a review of GDEs should apply more up-to-date definitions, classifications and data, which cover a greater range of potential high priority GDEs. These include:

- The updated GDE definition based on the Australian Government's Department of Environment and Energy, which aligns with other national approaches<sup>284</sup> and was adopted by DPIE-Water in 2016.<sup>285</sup>
- DPIE-Water's improved GDE identification method, including an ecological values assessment based on HEVAE framework criteria (naturalness, distinctiveness, vital habitat and diversity) – noting that this 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 GDEs.
- Up-to-date data from the National GDE Atlas.

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<sup>280</sup> Cresswell, R. (2020) *Technical advice related to groundwater dependent ecosystems and groundwater as covered by water sharing plans for the south coast (Murrumbidgee-Wallaga area unregulated and alluvial water sources (2010), Bega and Brogo rivers area regulated, unregulated and alluvial water sources (2011), and Towamba river unregulated and alluvial water sources (2010))*. Advice prepared for the Commission.

<sup>281</sup> DPIE-EES (2020) *Form and function of NSW intermittently closed and open lakes and lagoons- implications for entrance management*.

<sup>282</sup> Cresswell, R. (2020) *Technical advice related to groundwater dependent ecosystems and groundwater as covered by water sharing plans for the south coast (Murrumbidgee-Wallaga area unregulated and alluvial water sources (2010), Bega and Brogo rivers area regulated, unregulated and alluvial water sources (2011), and Towamba river unregulated and alluvial water sources (2010))*. Advice prepared for the Commission.

<sup>283</sup> For more detail on previous analysis of these issues see previous commission reports at Natural Resources Commission (2021) *Water Sharing Plan Reviews*. Available at: <https://www.nrc.nsw.gov.au/wsp-reviews>.

<sup>284</sup> Including the National Groundwater Dependent Ecosystem Atlas (Australian Government Bureau of Meteorology (n.d.) *Groundwater Dependent Ecosystems Atlas*. Available at: <http://www.bom.gov.au/water/groundwater/gde/map.shtml>) and the GDE Tool Box (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](http://www.bom.gov.au/water/groundwater/gde/GDEToolbox_PartOne_Assessment-Framework.pdf)).

<sup>285</sup> The Plans currently define high priority GDEs as 'ecosystems which have their species composition and natural ecological processes wholly or partially determined by groundwater'. The updated definition for GDEs are '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' (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](http://www.water.nsw.gov.au/__data/assets/pdf_file/0011/691868/High-Probability-GDE-method-report.pdf)).

- The findings of relevant studies undertaken during the plan period.<sup>286</sup>

As recommended in previous water sharing plan reviews,<sup>287</sup> the replacement Plans should clarify and strengthen objectives, terminology and, where required, provisions for GDEs that are not classified as high priority due to environmental values:

- 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.<sup>288</sup> 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.
- The climatic variability clauses of the Plans<sup>289</sup> should include references to the maintenance of groundwater dependent ecosystems like the *Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources 2009*.<sup>290</sup>

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 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.

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<sup>286</sup> SKM (2011) *National framework for integrated management of connected groundwater and surface water systems*, Waterlines report series No. 57, National Water Commission, Canberra; Williams, J.P., Kuginis, L., Serov, P. and Byrne, G. (2012) *Risk assessment guidelines for groundwater dependent ecosystems, Volume 2. Worked examples for seven pilot coastal aquifers in NSW*, NSW Department of Primary Industries, Office of Water, Sydney; Serov, P., Kuginis, L. and Williams, J.P. (2012) *Risk assessment guidelines for groundwater dependent ecosystems, Volume 1. The Conceptual framework*. NSW Department of Primary Industries, Office of Water, Sydney; Kuginis, L., Byrne, G., Serov, P. and Williams, J. P. (2012a) *Risk assessment guidelines for groundwater dependent ecosystems, Volume 3. Identification of high probability groundwater dependent ecosystems on the coastal plains of NSW and their ecological value*. NSW Department of Primary Industries, Office of Water, Sydney; Kuginis, L., Williams, J.P., Byrne, G. and Serov, P. (2012b) *Risk assessment guidelines for groundwater dependent ecosystems, Volume 4. The ecological value of groundwater sources on the coastal plains of NSW and risk from groundwater extraction*. NSW Department of Industries, Office of Water, Sydney.

<sup>287</sup> For more detail on previous analysis of these issues see previous commission reports at Natural Resources Commission (2021) *Water Sharing Plan Reviews*. Available at: <https://www.nrc.nsw.gov.au/wsp-reviews>.

<sup>288</sup> See the relevant section of each of the south coast plans: Bega Brogo Plan Clause 78(a) and (b), Murrrah-Wallaga Plan Clause 51(a) and (b), and Clause 53(a) and (b)

<sup>289</sup> Clause 14 of the Towamba Plan, Bega Brogo Plan and Murrrah-Wallaga Plan.

<sup>290</sup> See Clause 14(c) of the Plan.



As an example of where there are likely to be newly identified high priority GDEs, the coastal wetlands that occur across the plan areas, as highlighted above, are likely to be groundwater dependent. With the view that many of these will most likely exhibit high ecological value, rules for water supply works should consider the necessary requirements to avoid impacts to these sensitive environmental areas. Given these coastal wetlands are currently covered under mapping prepared for SEPP 14 within the State Environmental Planning Policy (Coastal Management SEPP), this mapping could be used as an indicative location of Type 2 GDE's across the Plan areas.

As recommended in previous reviews, setback distances to protect GDEs from groundwater extraction should align with the *NSW Aquifer Interference Policy*. However, these plans include caveats that potentially place GDEs at risk. For example, water supply works are not required to submit a hydrogeological study demonstrating to the Minister's satisfaction that water supply works will result in no greater impact on water sources or their groundwater dependent ecosystems. Without a hydrological study, there is no way to determine if works are likely to impact on groundwater dependent or culturally significant sites. These exemptions should be reviewed to ensure environmental values are protected and that procedures align with the policy.

Clause 67 (3) from the *Water Sharing Plan for the Richmond River Area Unregulated, Regulated and Alluvial Water Sources 2010* provides a guide to the provisions that should be included in the replacement Plans:

*'For the purposes of subclause (2) (c) (ii), the Minister may require the applicant to submit a hydrogeological study, assessed as adequate by the Minister, to demonstrate that the construction of the work at a different depth to the existing water supply work will result in no greater impact on a water source or its dependent ecosystems'.*

## 6.6 Cochran Dam environmental flow rules should be reviewed

Cochran Dam is an instream storage located in the headwaters of the Bemboka River in the Bega and Brogo Plan area. It is primarily used for electricity generation (for the Brown Mountain Power Station), with a secondary purpose of increasing the reliability of water supply to irrigators and Bemboka township downstream.

The Bega Brogo Plan includes operational rules for Cochran Dam that are intended to provide for the environment and community needs. Clause 32(1)(a) of the Bega Brogo Plan requires the lesser of 3.5 ML/day or daily inflows to Cochran Dam water storage to be released as daily flows from Cochran Dam between 1 October and 31 March.<sup>291</sup> The Plan's background document indicates that the aim of these releases during periods of low flow is to maintain a minimum flow of 2 ML per day at Kanoona (gauge 219032), providing for connectivity along the Bemboka River between Cochran Dam and Kanoona and ensuring water for basic rights.<sup>292</sup> The Plan also includes provisions for a drought reserve.<sup>293</sup> These rules were determined by the South Coast Water Management Committee during Plan development and draw on previous work, including the Bega-Bemboka River Flow Plan (prepared by the Bega Valley Water

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<sup>291</sup> Except for when the drought reserve is being released.

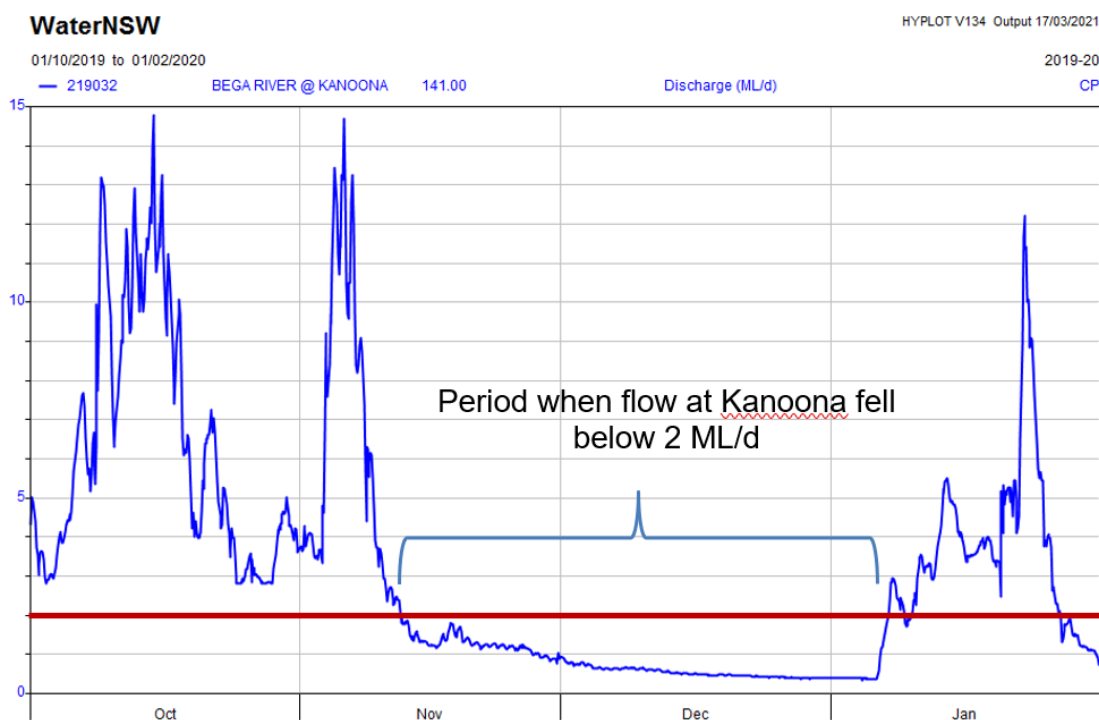
<sup>292</sup> Office of Water (2011) *Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources - Background document*. Available at:  
[http://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0006/547287/wsp\\_bega\\_background.pdf](http://www.water.nsw.gov.au/__data/assets/pdf_file/0006/547287/wsp_bega_background.pdf).

<sup>293</sup> Clause 32(2) of the Bega Brogo Plan.

Management Committee in 1999), which identified the river flow and access conditions required to protect refuge pools.<sup>294</sup>

While the studies that informed environmental flow rules for Cochrane Dam were considered fit for purpose when the Bega Brogo Plan commenced, flow and climate data collected over the life of the Plan indicates that they may no longer be adequate.

The Commission did not see evidence of ecological monitoring of these releases during the Bega Brogo Plan period. However, analysis of flows at Kanoona indicates that flows have fallen below 2 ML per day, notably during the 2019-20 drought (between November 2019 and early January 2020, see **Figure 12**). This period coincides with when release of the Cochrane Dam drought reserve was triggered (release of the drought reserve commenced 15 November 2019). The Commission notes that while the aim of the releases from Cochrane Dam is to maintain a minimum flow of 2ML per day, this is currently not included as a provision in the Plan, and as such there are no issues of compliance associated with releases falling below the target flow. Following any update of environmental flow requirements, the determined flow target should be codified in the Plan to best ensure the maintenance of minimum flows.



**Figure 12: Flow data for Bega River at Kanoona gauge (219032))**

Analysis undertaken to inform the *Draft South Coast Regional Water Strategy* indicates that the peak daily demand of all unregulated licences in the Bega Catchment upstream of Kanoona is 147 ML per day. This is more than double the 80<sup>th</sup> percentile flow (flow that is exceeded 80 percent of the time) and will likely be exacerbated with a changing climate, with a reduction in flows placing more pressure on the environment.

<sup>294</sup> Corbett, P., and McPhee, D. (1999) *Bega Bemboka River Flow Plan*, prepared by the Bega Valley Water Management Committee.

Environmental flow rules should be revisited in developing the replacement Bega Brogo Plan to ensure they are based on best available information. This review should consider work currently underway to determine environmental flow requirements for coastal rivers.

The 2019-20 drought also highlighted that the current drought reserve for Cochrane Dam in the Bega Brogo Plan should be reassessed to consider conditions experienced during the life of the Bega Brogo Plan and future climate scenarios.<sup>295</sup> The drought reserve allows either a volume of 500 ML or 800 ML to be set aside in Cochrane Dam under certain conditions to provide water for critical human needs<sup>296</sup> (town water supply, domestic and stock use) and the environment. The volume required under the drought reserve is determined according to time in the calendar year where 500ML is required if inflows are impacted for the three months prior to 31 March and 800ML must be set aside if inflows are affected for the three months prior to 30 June.

The Commission notes that increasing the drought reserve would have implications for hydropower generation, as the stored drought reserve can account for between 18.5 (500 ML) to 29.6 (800 ML) percent of dam capacity. While Cochrane Dam Pty Ltd advised that it aims to keep the water levels above the drought reserve, this depends on operating arrangements to achieve maximum power generation, particularly during peak energy demand, and market factors.<sup>297</sup>

DPIE-Water is responsible for managing the drought reserve and monitoring conditions that would trigger storing of the drought reserve and its release. However, this role and the role of the owner/operator of the dam (Cochrane Pty Ltd) in releasing the drought reserve are not clearly articulated in the Bega Brogo Plan.

Accountability and transparency around the management of the drought reserve can be improved. DPIE-Water took on the role when the reserve was stored and released in 2019-20, with several stakeholders noting that this was a consultative, 'well run' process. However, there were calls for the management of the drought reserve to be formalised within the Bega Brogo Plan to ensure clarity and accountability. Bega Valley Shire Council considered that account keeping for the reserve could be more transparent. The Commission recommends that the replacement Bega Brogo Plan should clearly state that the agency or a delegate of the Minister for Water should have responsibility for administering the drought reserve.

According to DPIE Water, storage of the Cochrane Dam drought reserve has been triggered twice over the life of the Bega Brogo Plan. The first reserve was not released due to rainfall occurring before release requirements were triggered. According to DPIE Water, the second reserve was released 15 November 2019 to 8 February 2020 (around 313 ML was released prior to the release being stopped due to rainfall).

DPIE-Water indicated that the conditions under which the release occurred were extraordinary and flows did not behave as expected, taking longer to travel downstream and experiencing significant transmission losses:

*'Conditions were so unprecedented that it wasn't behaving in a way as expected e.g. how long it took for flow to reach certain gauges downstream i.e. ten days rather than two days [to reach Kanoona] due to dry spell and associated transmission losses.'*<sup>298</sup>

<sup>295</sup> Clause 32(2) of the Bega Brogo Plan.

<sup>296</sup> Clause 11(p) of the Bega Brogo Plan.

<sup>297</sup> Interview: Hydro Power Pty Ltd, 1 February 2021.

<sup>298</sup> Interview: DPIE-Water, 10 December 2021.

While the release provided several benefits downstream, there are opportunities for improvement. The *South Coast Regional Water Strategy* and also the replacement Bega Brogo Plan, should consider the appropriateness of the current drought declaration definition, flow triggers and volume of reserve given more recent flow data and climate projections. For example, the trigger for the current reserve only considers dry periods that occur during late summer/early autumn (i.e. whether the three months to 30 March are drought declared), which may be insufficient if the plan area experiences extended dry conditions outside this timeframe. The trigger also considers whether inflows are less than the 1 in 20-year minimum inflow sequence. It is likely that flow sequence and average daily flows are different to those currently in the Bega Brogo Plan if additional data collected over the life of the Plan are considered.

The management of Cochrane Dam is a relatively unique case, as there are few unregulated rivers in NSW used for hydropower generation. As such, there are limitations in the extent to which the Act and water sharing plans can direct the operation of the dam. The Commission notes that the *Draft South Coast Regional Water Strategy* includes two options related to Cochrane Dam aimed at increasing water security for water users.<sup>299</sup> However, neither option explicitly addresses environmental needs as required under the Bega Brogo Plan. As such, the Commission supports further analysis of environmental flow requirements as part of the *South Coast Regional Water Strategy* and Plan remake, in consultation with key stakeholders, including Cochrane Pty Ltd. The Commission also notes that increasing the drought reserve above the volumes currently provisioned in the Bega Brogo Plan and extending the period of the drought reserve may trigger compensation (See **Section 10**).

## 6.7 Impacts of bushfires should be considered in remaking plans

Government agencies are currently working to understand the potential longer term impacts of the recent bushfires on the south coast plan area waterways. There is evidence that impacts from the bushfires go well beyond the immediate impacts to water quality and supply (see also **Section 2.10**). For example:

- In terms of post-fire impacts on aquatic ecosystems, '*extremely high levels of turbidity and low dissolved oxygen concentrations resulting from export of fine sediment and organic matter present the greatest threat*'.<sup>300</sup> The impacts of erosion and water quality will likely be spatially variable across the fire affected catchments, dependent on rainfall quantity and intensity and temporally affected by the rate of revegetation. Therefore, ongoing monitoring is important to better understand these impacts.
- Water quality impacts have been linked to degradation of fish habitat<sup>301</sup> and a decline in fish populations as was observed following a post-fire debris flow in north-eastern

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<sup>299</sup> Option 14: Improve releases from Cochrane Dam to better match water demands of irrigators – this option would investigate opportunities to improve water release (and water take) arrangements from Cochrane Dam to balance the needs of downstream water users and Cochrane Pty Ltd (this option does not propose to prescribe any new water reservation and release arrangements between Cochrane Dam Pty Ltd and water users into the region; Option 20: Increase the capacity of Cochrane Dam – this option proposes raising the height of the dam wall to increase capacity.

<sup>300</sup> University of Melbourne (2011) *Desktop review – impacts of bushfires on water quality*. Prepared for the Australian Government Department of Sustainability, Environment, Water and Communities, p. 34. Available at: <https://www.waterquality.gov.au/sites/default/files/documents/impact-bushfires.pdf>

<sup>301</sup> Alexandra, J. & Finlayson, C.M. (2020). Floods after wildfires: rapid responses for reducing impacts of sediment, ash, and nutrient slugs. *Australasian Journal of Water Resources*, 24: 9-11.

Victoria.<sup>302</sup> Post-fire water quality issues have also been linked to changes in macroinvertebrate assemblages and microalgae.

- The impacts are not just limited to the freshwater reaches of fire affected catchments as sediment slugs and contaminants introduced to waterways post fire also impact coastal and marine environments, including oysters which are filter feeders.
- DPI-Fisheries has advised that a significant area of the predicted range of the Australian grayling and *Claytons Spiney Crayfish (Euastacus claytoni)* was impacted by the recent fires in NSW. Other species have also been impacted.
- As part of the Forest Monitoring and Improvement Program, the Natural Resources Commission in collaboration with other agencies and academic institutions is undertaking monitoring of bushfire impacts and developing new remote sensing tools for undertaking risk assessments to aid post-fire ecological recovery. These tools aim to support ongoing monitoring and research that will provide post-fire recovery data over longer timescales. The Commission is also working on post-fire recovery decision support products and applications.<sup>303</sup>

While the relationship between post-fire sedimentation rates and altered water chemistry are well-documented, there are currently knowledge gaps and a degree of uncertainty around how long it takes for instream biota and food webs to return to pre-fire conditions.<sup>304</sup> The environmental flow requirements of many impacted aquatic species, and the potential long-term impacts of sediment slugs and contaminants on those species are unclear. For some species there is a better understanding of flow requirements and tolerance to water quality perturbations, which can be used as a basis for determining how to manage the river systems to improve environmental outcomes post bushfire and support recovery of aquatic ecosystems.

Work is currently being undertaken by a number of government agencies including DPIE-EES, DPI Fisheries, Bega Valley Shire Council, and academic institutions to build an understanding of the full range of impacts and responses that may assist in ecosystem recovery. Examples of such research include:

- The oyster industry has been significantly impacted by the fires, with ash fallout, poor water quality arising from post-fire rainfall events and algal blooms preventing oyster harvest. UTS in collaboration with oyster growers on the NSW South Coast are monitoring the impacts of ash and algal blooms on oysters.<sup>305</sup>
- DPIE- EES and Bega Valley Shire Council are undertaking estuarine monitoring to determine impacts of the bushfire.

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<sup>302</sup> Lyon J and O'Connor J, 2008, 'Smoke on the water: Can riverine fish populations recover following a catastrophic fire-related sediment slug?', *Austral Ecology* (2008) 33, 794-806

<sup>303</sup> Further information on the Forest Monitoring and Improvement Program is available at <https://www.nrc.nsw.gov.au/fmip>

<sup>304</sup> Joehnk K.D., Biswas T.K., Karim F., Kumar A., Guerschman J., Wilkinson S., Rees G., McInerney P., Zampatti B., Sullivan A. and Nyman, P. (2020) Water quality responses for post 2019-20 bushfires floods in south eastern Australia - a catchment scale analysis. A Technical Report for the CSIRO strategic bushfire project 2020 . Available at:

[https://www.researchgate.net/publication/345699893\\_Water\\_quality\\_responses\\_and\\_mitigation\\_options\\_for\\_post\\_2019-20\\_bushfires\\_floods\\_in\\_south\\_eastern\\_Australia\\_-\\_a\\_catchment\\_scale\\_analysis\\_A\\_Technical\\_Report\\_for\\_the\\_CSIRO\\_strategic\\_bushfire\\_project\\_2020](https://www.researchgate.net/publication/345699893_Water_quality_responses_and_mitigation_options_for_post_2019-20_bushfires_floods_in_south_eastern_Australia_-_a_catchment_scale_analysis_A_Technical_Report_for_the_CSIRO_strategic_bushfire_project_2020)

<sup>305</sup> UTS (2020) Ah shucks: how bushfires can harm and even kill our delicious oysters. Available at: <https://www.uts.edu.au/news/health-science/ah-shucks>

- Bega Valley Shire Council was awarded a bushfire affected coastal waterways grant for the *Bega Valley catchment stabilisation and estuarine ecological health protection project*.<sup>306</sup>

The Commission anticipates that recovery from bushfires, including impacts to aquatic ecosystems will continue to be a focus of research in the near future. There is a paucity of information for a number of aquatic species, with most fire-related research focused on terrestrial species. For example, the majority of studies on post-fire impacts on invertebrates are in terrestrial habitats (94 percent) compared to freshwater habitats, and there have been no bushfire impact studies on marine invertebrates.<sup>307</sup> Available research should be used in the plan remakes to inform any potential changes needed to environmental water provisions. For example, evidence may suggest that amendments to adjust cease to pump levels or total daily extractions limits post significant bushfire events might be appropriate to support the post-fire recovery of aquatic species.

## 6.8 Recommendations

<p><b>R 6 – All Plans</b></p>	<p>To ensure estuary condition is maintained in the Plan areas, DPIE-Water should:</p> <ul style="list-style-type: none"> <li>a) by 1 July 2023, establish clear objectives and estuarine flow requirements for estuaries across the Plan areas</li> <li>b) by 1 July 2023, include provisions to achieve the estuarine flow requirements defined in (a), including clear agency responsibilities</li> <li>c) use data from the DPIE-EES estuarine monitoring program and NSW Food Authority to monitor estuarine condition and identify changes to estuarine condition that may be impacted by the Plans. Plan provisions should be adjusted as required to ensure that there is sufficient planned environmental water to respond to the needs of these estuaries.</li> </ul>
<p><b>R 7 – All Plans</b></p>	<p>By 1 July 2023, to ensure threatened species and endangered ecological communities are protected, DPIE-Water should:</p> <ul style="list-style-type: none"> <li>a) finalise work to establish environmental flow requirements<sup>308</sup> for coastal aquatic species and ensure that plan rules adequately protect them</li> <li>b) amend plan rules (for example, cease to pump rules and TDELs) where evidence indicates unacceptable impact on low flows.</li> <li>c) implement monitoring within the plan areas at key strategic locations where significant extraction overlays high environmental values</li> <li>d) complete HEVAE mapping so that there is an updated assessment of strategic monitoring locations</li> </ul>

<sup>306</sup> DPIE EES (2020) Bushfire affected coastal waterways grants – grants awarded and project summaries. Available at: <https://www.environment.nsw.gov.au/topics/water/coasts/coastal-and-estuary-grants/bushfire-affected-coastal-waterways/grants-awarded#bega>

<sup>307</sup> Saunders, M. E., Barton, P. S., Bickerstaff, J. R. M., Frost, L., Latty, T., Lesard, B., Lowe, E.C., Rodriguez, J., White, T.E. and Umbers, K.D.L.(2021) Limited understanding of bushfire impacts on Australian invertebrates. *Insect Conservation and Diversity*, <https://doi.org/10.1111/icad.12493>

<sup>308</sup> Flow requirements may include any part of the flow duration curve that is a low flow, large fresh or small fresh



	<ul style="list-style-type: none"> <li>e) update any necessary plan provisions to account for protection of threatened species where updated HEVAE assessment and extraction pressure information identifies that current rules are insufficient</li> <li>f) ensure alignment with environmental objectives outlined in relevant NSW Government strategic plans including the Batemans Marine Park Operational Plan</li> </ul>
<b>R 8 – All Plans</b>	<p>By 1 July 2023, to improve the management of connectivity to protect water sources and dependent ecosystems, DPIE-Water should:</p> <ul style="list-style-type: none"> <li>a) use best available evidence and undertake additional required studies to identify highly connected systems, including the Mid Bega River Sands</li> <li>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 in (a) as being highly connected and stage access rules for existing bores</li> <li>c) determine the level of connectivity between the aquifers and rivers in the Plans and Coastal Sands aquifers and, if highly connected, provide protection</li> <li>d) include comprehensive definitions for surface-groundwater connectivity in the Plan dictionaries.</li> </ul>
<b>R 9 – All Plans</b>	<p>By 1 July 2023, to improve the management of GDEs, DPIE-Water should:</p> <ul style="list-style-type: none"> <li>a) map and ground-truth the presence and extent of GDEs, including estuarine and coastal ecosystems and define their groundwater requirements</li> <li>b) clearly define groundwater terms and their relevance to the Plans, including GDE priority and types (including high-priority GDEs)</li> <li>c) review the GDEs in the <i>South Coast Groundwater Plan</i> and where appropriate recognise them in the South Coast replacement Plans</li> <li>d) review setback distances for work near identified GDEs and standardise them based on the <i>NSW Aquifer Interference Policy 2012</i>.</li> </ul>
<b>R 10 – Bega Brogo Plan</b>	<p>To ensure environmental flows and drought reserves from Cochrane Dam deliver environmental and social outcomes downstream, DPIE-Water should:</p> <ul style="list-style-type: none"> <li>a) use best available information to investigate the need and options to increase the Cochrane Dam drought reserve, including consideration of: <ul style="list-style-type: none"> <li>- the adequacy of the drought reserve volume for a range of climatic scenarios</li> <li>- revising the definition and triggers (for storing and release) of the drought reserve</li> <li>- lessons from the recent drought (including system losses) and up to date data on environmental and critical human needs</li> </ul> </li> <li>b) review daily flow releases from Cochrane Dam (including current timing and release volumes) based on a better understanding of environmental needs and the latest flow data.</li> <li>c) by 1 July 2023, as part of the Bega Brogo Plan replacement: <ul style="list-style-type: none"> <li>- include any necessary changes to provisions based on (a) and (b)</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>- formalise the flow targets at Kanoona currently outlined in the Background Document but not included as a provision in the Plan</li> <li>- ensure roles and responsibilities for reserve and releases are clearly stated in the Plan.</li> </ul>
<b>R 11 - All Plans</b>	<p>By 1 July 2023, to assist the environment in recovering from bushfires and minimise future risks, DPIE-Water should:</p> <ul style="list-style-type: none"> <li>a) collaborate with DPI-Fisheries and DPIE-ESS to better understand the impacts of bushfires on aquatic species and determine any specific flow requirements that may aid recovery (e.g. cues for fish spawning)</li> <li>b) include a provision that can be triggered to support the protection of particular flow events to aid the post-fire recovery of aquatic ecosystems.</li> </ul>
<b>Suggested action (SA) A</b>	NSW agencies continue to work with landholders to support riparian management throughout the catchments.



## 7 Town water supply

Town water supply needs were mostly met over the life of the Plans. However, recent pressures from drought and bushfire have highlighted several issues that should be addressed, particularly to ensure risks from future climate change and variability can be managed. These include:

- addressing risks to town water supply in emergency situations (**Section 7.1**)
- assessing risks around meeting peak daily demand (**Section 7.2**)
- ensuring Plans consider the latest flow and climate data, and future climate scenarios (**Section 7.3**)
- ensuring water quality issues (including following bushfire events) can be managed (**Section 7.4**)
- monitoring and planning for risks from saltwater intrusion (**Section 7.5**).

### 7.1 Risks from bushfires and other emergencies should be considered

Several water sources and water supply systems in the plan areas were impacted by the 2019-20 bushfires (see **Section 2.10**), highlighting limitations in the ability of plan provisions to ensure Bega Valley Shire Council can meet town water supply needs during emergency situations.

For example, Ben Boyd Dam is an alternative water source for town water supply in the Towamba Plan area when flows are in the low or very low flow classes. During the 2019-20 bushfire emergency, Ben Boyd Dam was contaminated after a helicopter was required to ditch into the dam. As such, when alternative sources for town water supply were required during low flows and bushfire events, Ben Boyd Dam was unable to be used. Bega Valley Shire Council was required to draw on the Kiah Borefield. This action, although required to provide critical human water needs, exceeded the Towamba Plan's daily extraction limits for the Kiah Borefield (1 ML per day).<sup>309</sup>

While water use for emergency purposes (such as fire response) is covered under the *Fires and Rescue NSW Act 1989* and the *Rural Fires Act 1997*,<sup>310</sup> there are no specific emergency management clauses in the Plans to ensure critical water needs can be met during and after emergency events, such as if water supply systems have been impacted by bushfire.

Bega Valley Shire Council advised that other situations may arise where it may need to access more than the 1 ML per day extraction limit from the Kiah Borefield. For example, this might occur when an algal bloom or other water quality issues affect Ben Boyd Dam.

Water quality issues following the 2019-20 bushfires also highlight the importance of ensuring the Plans support the flexible management of water supply systems and their water sources to ensure the community has secure access to quality drinking water. For example:

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<sup>309</sup> Clause 42(6)(b)(i) of the Towamba Plan.

<sup>310</sup> Section 15 of the *Fires and Rescue NSW Act 1989* allows for officers in charge at a fire to take and use any water from any source on any land for the purpose; Section 26 of the *Rural Fires Act 1997* allows an officer of a rural fire brigade for the purpose of controlling or suppressing a fire to take and use water from any source on any land without payment.

- Water restrictions were imposed in January 2020 for Bermagui after rain introduced ash and nutrients into the waterways post fire, requiring water to be trucked into several towns from the Bega Borefield and establishment of a mobile treatment plant at Brogo Dam.
- In the Murrah-Wallaga Plan area, Couria Creek (a tributary of Wallaga Lake) has increasingly become an important drinking water source since 2019-20, due to the impacts of fires on the Brogo Catchment. Bega Valley Shire Council advised that this is likely to continue to ensure system resilience.

In the development of the replacement Plans, DPIE-Water should consider including emergency management clauses that, when triggered, allow the local water utility to temporarily draw on individual water sources in emergency situations. In particular, the inclusion of a clause in the Towamba Plan allowing for greater than 1 ML per day to be extracted from the Kiah Borefield by Bega Valley Shire Council under limited conditions should be considered. Emergency provisions should be able to be enacted at short notice for short periods only to ensure critical supply needs are met in emergency situations. In developing emergency management clauses, DPIE-Water should assess the risks associated with increased take from individual sources and consider whether it is appropriate to offset this temporary increase in extraction to allow for water source recovery.

DPIE-Water also noted that having a single licence for Bega Valley Shire Council (local water utility) that covers all water sources could also provide the flexibility to manage water supply systems in emergency situations (as well as to manage peak daily demand, as discussed in **Section 7.2**). The Commission notes that the Act limits the ways in which this can be done. However, the approach in place across the Central Coast and Hunter water sharing plans may be used as a model for management of town water supply entitlement across Plans. The Commission considers that having flexible emergency provisions is likely more appropriate for emergency situations. If this option was to be considered further, DPIE-Water would need to assess the risks to environmental and equitable sharing outcomes and ensure appropriate measures are in place to protect these.

Other strategies to improve the management of impacts from bushfire and other emergency situations should also be explored. The *Draft South Coast Regional Water Strategy* recognises that the lessons learned from the 2019-20 bushfires should be considered in terms of environmental and community impacts and preparedness for future events. The draft strategy refers to the *Final Report of the NSW Bushfire Inquiry*, which highlights the need for increased water storage for firefighting and the importance of adequate access points for effectively filling firefighting tankers: '*Given the region's reliance on unregulated streams, options that increase the volume of water stored throughout the catchment may provide benefits in overcoming shortfalls in dry periods*'.<sup>311</sup> A discussion of the current DPIE-Water review considering an increase to harvestable rights that may facilitate the increase in water storage across the south coast plans is detailed in **Section 5.3**. This section outlines the need for further consideration of environmental impacts that may result from changes to catchment flows. Potential impacts must be investigated and accounted as part of any proposal to increase storage capacity.

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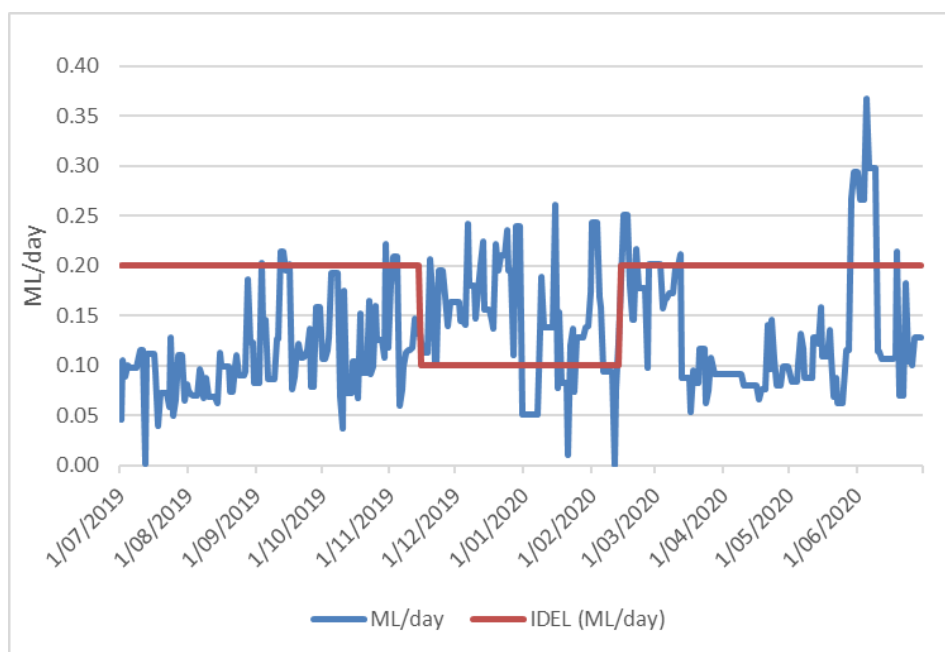
<sup>311</sup> DPIE (2020) *Draft Regional Water Strategy – South Coast*. Available at: [https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0020/329015/draft-rws-sc-strategy.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0020/329015/draft-rws-sc-strategy.pdf).

## 7.2 There are stakeholder concerns around meeting peak daily needs

Bega Valley Shire Council has raised concerns that the Plans' daily extraction limits are restrictive and pose a risk to meeting peak daily demand, particularly during the summer tourist season, when there is strong demand and drier conditions. Bega Valley Shire Council informed the Commission that there were occasions where demand for town water supply exceeded the daily extraction limit set out in the Bega Brogo Plan. For example, at Bemboka (see **Figure 13**).

Bega Valley Shire Council considers it has limited ability to meet town water supply needs for Bemboka (population around 300) under the Bega Brogo Plan's daily extraction limit of 0.2 ML per day (when no drought reserve releases are being made from Cochrane Dam).<sup>312</sup> This is further restricted when the limit is halved to 0.1 ML per day when drought reserve releases are being made from Cochrane Dam. The Bega Brogo Plan's background document indicates that these limits were adopted to '*strike a balance between water users along the Bemboka River, and water users in the Bemboka township*'.<sup>313</sup> The Commission notes that the Act gives priority to town water supply over other extractive uses and this should be reflected in the Plan rules.

Bega Valley Shire Council indicated it is impractical to reduce the supply of water to Bemboka in line with the plan rules and considers that the daily extraction limit should be reviewed. Both Bega Valley Shire Council and DPIE-Water's Water and Sewerage Team indicated that the 50 percent reduction in daily extraction when the drought reserve is being released is also unrealistic and should be revisited. The Commission was unable to identify a clear rationale for these rules. In developing the replacement Bega Brogo Plan, these rules should be revisited and adjusted as appropriate, ensuring environmental outcomes are protected.



**Figure 13: Extraction for Bemboka town water supply relative to Bega Brogo Plan extraction limits (2019-20 water year)<sup>314</sup>**

<sup>312</sup> Clause 65(16)(e)(i) of the Bega Brogo Plan.

<sup>313</sup> Office of Water (2011) *Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources – Background document*. Available at: [http://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0006/547287/wsp\\_bega\\_background.pdf](http://www.water.nsw.gov.au/__data/assets/pdf_file/0006/547287/wsp_bega_background.pdf).

<sup>314</sup> Extraction data provided by Bega Valley Shire Council.

The Bega Brogo Plan also limits daily extraction by Council from the Mid Bega River Sands Water Source. As noted in **Section 6.4.3**, through-flow limitations can result in localised drawdown of groundwater which poses a risk to operating levels for town water supply. As a result, the Bega Brogo Plan includes and assigns limits to manage inflows and subsurface extraction from bores. While limits appear to have been mostly effective at maintaining the groundwater level above minimum operating levels for town water supply, Bega Valley Shire Council indicated that groundwater levels have fallen below minimum operating levels.

Council also advised that it considers the 3.5 ML per day extraction limit for the Mid Bega River Sands Water Source<sup>315</sup> is too low to meet peak demand in summer periods. For towns popular with tourists such as Tathra and Bermagui, there is strong seasonal demand for town water. However, the *Draft South Coast Regional Water Strategy* highlights that quantifying water use by the tourism industry is complex.<sup>316</sup>

Bega Valley Shire Council has commissioned a peer-reviewed groundwater model for the Mid Bega River Sands aquifer, looking at a range of scenarios, including increasing the daily extraction limit to better understand any potential impacts from increasing daily extraction on water sources and other water users. This should be drawn upon in assessing the risks to meeting peak daily demand in developing the replacement Plans.

Any changes to daily extraction limits would need to be considered in the context of environmental impacts and whether changing the daily extraction limits is sustainable and equitable consistent with the Act requirements, noting that the Act gives priority to town water over other extractive uses.

DPIE-Water noted that having provisions allowing for Bega Valley Shire Council to shift access across all water sources could provide the flexibility to manage peak daily demand, though this would need to be implemented in a manner consistent with the Act. DPIE-Water could also consider the need for a seasonal approach to management of daily extraction limits to assist with the peak demand for town water supply. Without clear evidence of the risks to meeting peak daily demand, the Commission was unable to assess the appropriateness of this option. If this option was to be considered further, DPIE-Water would need to assess the risks to environmental and equitable sharing outcomes and ensure appropriate measures are in place to protect these.

### 7.3 Plan rules for town water supply must consider latest data

Current town water supply planning is based on climate projections at the time of plan development and flow data from 1890 to 2007. Potential climate change was considered in the development of the Plans. The Bega Brogo Plan's background document indicates that it was considered in the setting of access conditions and LTAAELs.<sup>317</sup> At the time of Plan development the Interagency Regional Panel concluded that the water management strategies developed by the Healthy Rivers Commission, South Coast Water Management Committee and South Coast Catchment Management Authority were appropriate under a range of climate scenarios.

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<sup>315</sup> Clause 65(16)(f) of the Bega Brogo Plan.

<sup>316</sup> DPIE-Water (2020) *Draft South Coast Regional Water Strategy*, p. 115. Available at: [https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0020/329015/draft-rws-sc-strategy.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0020/329015/draft-rws-sc-strategy.pdf).

<sup>317</sup> Office of Water (2011) *Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources – Background document*, p. 17. Available at: [http://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0006/547287/wsp\\_bega\\_background.pdf](http://www.water.nsw.gov.au/__data/assets/pdf_file/0006/547287/wsp_bega_background.pdf).

While the Commission recognises that an assessment of climate projections as part of plan development is good practice, the replacement Plans should consider the variability experienced over more recent decades, including the severe drought conditions experienced in 2019-20. There is also more contemporary information available, including stochastic modelling developed to inform the *Draft South Coast Regional Water Strategy* that should be considered. Plan background documents acknowledged that climate science was a relatively new area at the time of plan development and that *'future plans will need to consider what climatic sequence to adopt in determining the appropriate cease to pump rules and this is expected to be informed by better science available for the next plan'*.<sup>318</sup>

Analysis of the impact of potential climate change on dam operations as part of the *Draft South Coast Regional Water Strategy* found that Brogo Dam is likely to remain a reliable water supply (see **Section 2.6**), with overall water availability for the Bega and Tuross systems unlikely to be significantly impacted by changing climate.<sup>319</sup> However, recent drought conditions have highlighted risks to water supply during extreme events, with parts of the Bega Brogo Plan having to be suspended due to unforeseen pressure on the system from drought.

In January 2020, Brogo Dam was at 13.6 percent capacity due to extended dry conditions. Around this time, WaterNSW predicted that some communities in the Bega Brogo Plan area could run out of water, potentially requiring water to be carted in for 2,000 to 3,000 people. To mitigate this risk, access to general security accounts was prohibited to secure critical water supplies. The Minister announced a Section 324 Order for general security licence holders in the Bega and Brogo regulated rivers water source to address shortages. This order was repealed in February 2020 following rainfall and the towns did not run out of water. The dam reached full storage capacity shortly after the February rainfall event.

As discussed in **Section 6.6**, the 2019-20 drought also highlighted that the current drought reserve for Cochrane Dam in the Bega Brogo Plan should be reassessed to consider future climate scenarios and ensure critical human needs are met.<sup>320</sup>

The replacement Plan provisions should be underpinned by the latest flow data, groundwater monitoring, modelling and demand forecasting to better understand and manage risks to town water supply. This should include climate modelling undertaken for the *Draft South Coast Regional Water Strategy*. Bega Valley Shire Council advised that it also has several regional planning processes underway that should also inform the replacement Plans, including a groundwater model for the Mid Bega River Sands Aquifer.

Bega Valley Shire Council is also developing an Integrated Water Cycle Management Strategy and secure yield modelling, which is a requirement for local water utilities to set out how they will provide appropriate, affordable, cost-effective, and sustainable urban water services, while protecting public health and the environment. The strategy would ideally inform the *South Coast Regional Water Strategy* and be considered as part of the replacement Plans, given the water sources covered by the Plans are used for town water supply. However, Bega Valley Shire Council has not finalised its strategy and raised that the process is onerous and resource intensive, particularly for smaller councils. This is consistent with the findings of a recent report on the challenges that rural and regional water utilities face in

<sup>318</sup> Office of Water (2010). *Water Sharing Plan for the Towamba River Unregulated and Alluvial Water Sources – Background document*, p.10. Available at: [https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0010/166879/towamba-river-background.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0010/166879/towamba-river-background.pdf).

<sup>319</sup> DPIE (2020) *Draft Regional Water Strategy – South Coast*. Available at: [https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0020/329015/draft-rws-sc-strategy.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0020/329015/draft-rws-sc-strategy.pdf).

<sup>320</sup> Clause 32(2) of the Bega Brogo Plan.

planning and implementing Integrated Water Cycle Management Strategies.<sup>321</sup> DPIE-Water has provided Bega Valley Shire Council with 25 percent funding and is encouraging Council to complete the strategy. To ensure the strategy is ready to inform the development of the replacement Plans, DPIE-Water should consider simplifying the process for developing and implementing Integrated Water Cycle Management Strategies and assist with upskilling local water utilities in developing and implementing the strategies.

## 7.4 Efforts should continue to address water quality risks

Water quality has been an ongoing issue for town water supply in all plan areas. Water quality can be a key constraining factor in drawing on a water source. Lack of flexibility in managing across water sources increases the likelihood this will create a risk to town water supply.

While water quality is generally good in the Bega Valley, there are currently no multi-barrier water treatment plants for the region's four water supply systems (water is instead extracted and chlorinated).<sup>322</sup> This risks exposure to chlorine resistant pathogens such as *Cryptosporidium*. There have been several boil water notices issued by Council during the life of the Plans and NSW Health assessed the water quality at Bega, Brogo, Kiah, Tantawanglo and Yellow Pinch as high risk of pathogens. Improving the ability to treat water would help to address risks of potential water shortages.

The *Draft South Coast Regional Water Strategy* includes several infrastructure and operational options to increase the health and resilience of the system, some of which build on planned water treatment plant upgrades that should address some of the water quality risks in the region:

- Upgrade of the Brogo-Bermagui Water Treatment Plant – the planned upgrade has received just over \$10 million in funding through the NSW Government's Safe and Secure Water Program.<sup>323</sup> Construction is expected to commence in early 2021. Improving on existing treatment methods, the new water treatment plant will introduce filtration to remove suspended solids and other contaminants<sup>324</sup> and UV disinfection.
- Scoping study for a new water treatment plant at Yellow Pinch Dam – Bega Valley Shire Council received \$75,000 (25 percent of total costs) in funding under the Safe and Secure Water Program for a scoping study.

In addition to these works, water quality issues following the 2019-20 bushfires highlight the importance of ensuring the Plans support the flexible management of water supply systems to ensure the community has secure access to quality drinking water (see **Section 7.1**).

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<sup>321</sup> Kanpurwala, T. (2019) *Drivers and challenges of implementing integrated water-cycle management strategy in regional NSW*. Available at: <https://www.waterdirectoriate.asn.au/Blog/IWCM-in-NSW.aspx>.

<sup>322</sup> Bega Valley Shire Council (2017) *Bega Valley water supplies remain safe* [press release], 8 September. Available at: [https://begavalley.nsw.gov.au/cp\\_themes/default/page.asp?p=DOC-MUC-03-87-68](https://begavalley.nsw.gov.au/cp_themes/default/page.asp?p=DOC-MUC-03-87-68).

<sup>323</sup> DPI Industry (2020) *Safe and Secure Water Program – approved projects*. Available at: <https://www.industry.nsw.gov.au/water/plans-programs/infrastructure-programs/safe-and-secure-water-program/approved-projects>.

<sup>324</sup> Bega Valley Shire Council (2020) *Brogo Water Treatment Plant Upgrade*. Available at: [https://begavalley.nsw.gov.au/cp\\_themes/default/page.asp?p=DOC-VAD-06-81-62](https://begavalley.nsw.gov.au/cp_themes/default/page.asp?p=DOC-VAD-06-81-62).

## 7.5 Risks from saltwater intrusion should be monitored

The *Draft South Coast Regional Water Strategy* highlights future risks associated with saltwater intrusion into non-saline groundwater sources as estuary tidal limits move upstream due to sea level rise. Other factors that may contribute to saltwater intrusion including decreased flows, increased pressure from extraction and changes to flows from Brogo Dam to meet water needs, all of which may occur with a variable and changing climate.<sup>325</sup>

The risk of saltwater intrusion exists for groundwater sources in all of the Plans under review, but the consequence is particularly high in Bega Brogo Plan for the Mid Bega River Sands Alluvium Water Source given it provides significant town water supply for the Bega region. Saltwater intrusion also creates a risk of water being unusable for domestic and stock use and irrigation.

The draft strategy indicates that saltwater intrusion may occur over the next 30 to 80 years, which is beyond the term of the next replacement Plans.<sup>326</sup> However, the Commission does not have confidence in these timeframes, given that saltwater intrusion has been occurring more frequently in other parts of the NSW coast in recent years and anticipates that more contemporary forecasts will help to understand the level of risk and timing. The Commission considers there is potential for similar trends on the South Coast and that this risk should be actively monitored. The Commission supports the inclusion of saltwater intrusion cease to pump rules for the Mid Bega River Sands Alluvium Water Source in the remake of the Bega Brogo Plan. The Commission notes that these will need to be built to identify early saltwater intrusion as opposed to higher salinity triggers. This is because where higher levels of salinity are detected, it may be too late to reverse potential impacts.

As part of its planning options, the draft strategy also proposes that DPIE-Water collaborate with Local Land Services, councils and universities to co-design and implement local-scale projects to better understand and manage impacts from sea level rise induced saltwater intrusion, reduced water availability and other impacts linked to climate change. In addition, the draft strategy has proposed infrastructure options to provide additional supply in response to saline intrusion of the groundwater source, such as a pipeline from Brogo Dam to Bega-Tathra town water supply system. The Commission supports the implementation of these projects to ensure the region is prepared to address the risks associated with saltwater intrusion, provided environmental values are not compromised.

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<sup>325</sup> DPIE (2020) *Draft Regional Water Strategy – South Coast*. Available at:  
[https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0020/329015/draft-rws-sc-strategy.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0020/329015/draft-rws-sc-strategy.pdf).

<sup>326</sup> DPIE (2020) *Draft Regional Water Strategy – South Coast*, p.37. Available at:  
[https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0020/329015/draft-rws-sc-strategy.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0020/329015/draft-rws-sc-strategy.pdf).

## 7.6 Recommendations

<p><b>R 12 - All Plans</b></p>	<p>DPIE-Water should continue to work with Bega Valley Shire Council as part of the regional water strategy process and Plan remakes to improve town water supply systems and access. This should include:</p> <ul style="list-style-type: none"> <li>a) revisiting the assignment of TDELs to ensure that they are sustainable and don't unnecessarily constrain town water supply needs on a daily basis or compromise environmental values or other water users (notably domestic and stock use)</li> <li>b) consideration of an emergency management provision that, when triggered, allows the local water utility to temporarily draw on individual water sources in emergency situations</li> <li>c) investigating revision of Plan provisions that provide Bega Valley Shire Council with the flexibility to optimise its water supply systems to meet peak daily demand and critical human water needs in emergency situations</li> <li>d) ensuring that plan provisions are based on best available information including: <ul style="list-style-type: none"> <li>a. up-to-date flow data</li> <li>b. Bega groundwater modelling, including scenarios around increasing individual and total daily extraction limits and where possible, using these models to undertake more detailed assessment of the risks of saline intrusion of water sources used for groundwater</li> <li>c. latest climate data, including stochastic modelling of climate change undertaken as part of the <i>South Coast Regional Water Strategy</i>.</li> </ul> </li> <li>e) developing a salinity based cease to pump target for the Mid Bega River Sands and support ongoing monitoring of salinity to detect saltwater intrusion.</li> </ul>
<p><b>SA B</b></p>	<p>DPIE-Water should consider simplifying the process for developing and implementing Integrated Water Cycle Management Strategies and assist with upskilling local water utilities in developing and implementing strategies.</p>



## 8 Aboriginal water rights, values, and uses

The Commission continues to identify critical issues in water sharing plans relating to both native title and Aboriginal water values across all its reviews in the 2019-21 period (see **Box 3**).<sup>327</sup> In addition, research and reviews continue to show that Aboriginal water holdings are suffering disproportionately under NSW legislation, creating issues of inequity and further dispossession that need to be addressed at a state-wide scale<sup>328</sup> – in line with new Closing the Gap targets<sup>329</sup> and the recent Productivity Commission review of national water reform.<sup>330</sup>

### Box 3: Critical issues for Aboriginal water

- Native title provisions have failed to protect native title rights for registered claims and determinations, and do not consider future native title proactively
- Aboriginal values are not appropriately identified in plans and therefore not protected
- Aboriginal engagement in water planning has been inadequate, thereby limiting knowledge and support of wide-ranging values (not just traditional cultural uses)
- Aboriginal-specific water licences are highly restrictive in application and use, subject to limited awareness, and unable to be easily accessed and applied for
- Key barriers to Aboriginal water rights and interests are systemic and institutional and require statewide legislative, policy and practice change.

DPIE-Water has been working with key Aboriginal stakeholders to develop an Aboriginal water strategy for NSW and improve engagement.<sup>331</sup> Strengthening these actions is critical to

<sup>327</sup> The Commission has highlighted some of its consistent findings in its review of water sharing plan reviews on its website, see <https://www.nrc.nsw.gov.au/aboriginal-projects>. Recent water sharing plan reviews are also publicly available that outline issues relating to native title and Aboriginal water values for example the Greater Metropolitan surface and groundwater plans (Section 9), Richmond and Tweed plans (Section 8), Hunter Unregulated and Alluvial plan area (Section 6.2) and the Lower North Coast plan area (Section 4.2) at Natural Resources Commission (2021) *Water Sharing Plan Reviews*. Available at: <https://www.nrc.nsw.gov.au/wsp-reviews>.

<sup>328</sup> A recent study of empirical water entitlement data in the NSW portion of the Murray-Darling Basin showed that, while Aboriginal people in this area constitute nearly 10 percent of the population, their organisations hold only 0.2 percent of available surface water. In addition, 17.2 percent of Aboriginal water holdings by volume were lost from 2009–18 (Hartwig, L., Jackson, S., Osborne, N. (2020) 'Trends in Aboriginal water ownership in New South Wales, Australia: The continuities between colonial and neoliberal forms of dispossession', *Land Use Policy* 99).

<sup>329</sup> The new National Agreement on Closing the Gap (July 2020) includes two associated targets for land and water: *Target 15a*: By 2030, a 15 percent increase in Australia's landmass subject to Aboriginal and Torres Strait Islander people's legal rights or interests; *Target 15b*: By 2030, a 15 percent increase in areas covered by Aboriginal and Torres Strait Islander people's legal rights or interests in the sea (agreement available at: [www.closingthegap.gov.au/sites/default/files/files/national-agreement-ctg.pdf](http://www.closingthegap.gov.au/sites/default/files/files/national-agreement-ctg.pdf)).

<sup>330</sup> The Productivity Commission recommends that a new element of the National Water Initiative be co-designed by the Committee on Aboriginal Water Interests to give issues associated with Aboriginal people's interests in water the status in policy making specified in the National Agreement on Closing the Gap 2020. The element should include advice on water management measures to achieve cultural and economic outcomes (Productivity Commission (2021) *National Water Reform 2020 Draft Report*. Available at: <https://www.pc.gov.au/inquiries/current/water-reform-2020/draft>).

<sup>331</sup> Priority 2 under the *Draft NSW Water Strategy 2021* sets out several actions to 'recognise Aboriginal rights and values and increase access to and ownership of water for cultural and economic purposes': establish a partnership agreement with the Aboriginal Water Coalition; strengthen the role of First Nations in water planning and management; develop a state-wide Aboriginal water strategy; provide Aboriginal ownership of and access to water for cultural and economic purposes; work with First Nations to improve shared water knowledge; work

improving state-wide water sharing and addressing ongoing inequity in Aboriginal water rights and interests.

Key examples of these critical issues identified in the Plan areas are outlined in the following sections.

## 8.1 Native title needs recognition

The Plans include an objective to protect basic landholder rights, which include native title rights,<sup>332</sup> and a performance indicator to monitor the extent to which native title requirements have been met.<sup>333</sup> They also include a provision to support amendments where native title rights may change under the *Native Title Act 1993*.<sup>334</sup>

The Plans each state '*there are no native title rights in these water sources. Therefore the water requirements for native title rights total 0 ML/year*'.<sup>335</sup>

The Plan areas include a large registered native title claim of the South Coast People (see **Section 2.7** and **Figure 7**). The claim was first filed in August 2017 and formally registered in 2018. Under registered native title claims, government agencies are required to consult with claimants on any development or land use projects and should allow claimants a greater say in management of land and waters.

Stakeholders confirmed that the lack of recognition of native title was a key concern of Yuin peoples. This is illustrated in the quote below and expressed strongly in relation to Aboriginal water values and fishing rights (see **Section 8.2**).

*'We finally passed the recognition test for Yuin Native Title but we are still fighting ... we could finally get our waters back one day but it could be destroyed by then'*.<sup>336</sup>

The Commission recommends that the Plans are updated as part of the Plan remake to recognise the registered native title claim of the South Coast People.

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with Aboriginal people to maintain and preserve water-related cultural sites and landscapes (DPIE (2021) *Draft NSW Water Strategy*. Available at: [www.industry.nsw.gov.au/water/plans-programs/strategy/draft](http://www.industry.nsw.gov.au/water/plans-programs/strategy/draft)).

<sup>332</sup> Water sharing plans for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources 2011 – Part 2 Clause 10(d); Murrrah-Wallaga Area Unregulated and Alluvial Water Sources 2010 – Part 2 Clause 10(c); Towamba River Unregulated and Alluvial Water Sources 2010 – Part 2 Clause 10(c).

<sup>333</sup> Water sharing plans for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources 2011 – Part 2, Division 2 Clause 12(h); Murrrah-Wallaga Area Unregulated and Alluvial Water Sources 2010 – Part 2, Division 2 Clause 12(h); Towamba River Unregulated and Alluvial Water Sources 2010 – Part 2, Division 2 Clause 12(h).

<sup>334</sup> Water Sharing Plans for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources 2011 – Part 3, Division 2 Clause 21; Murrrah-Wallaga Area Unregulated and Alluvial Water Sources 2010 – Part 3, Division 2 Clause 21; Towamba River Unregulated and Alluvial Water Sources 2010 – Part 3, Division 2 Clause 21.

<sup>335</sup> *Ibid.*

<sup>336</sup> Interview: Yuin man, Narooma, 3 February 2021.

## 8.2 Known Aboriginal values are not protected by the Plans

The Plans include general objectives<sup>337</sup> and performance indicators<sup>338</sup> regarding the protection and recognition of Aboriginal, cultural and heritage values of the water sources – these are common to water sharing plans. Only the Bega Brogo Plan includes a dedicated strategy to address this objective.<sup>339</sup> Unlike other water sharing plans, they do not recognise Aboriginal values in a vision statement or allow for amendments when values are identified in the future.

Across the Plans, Aboriginal water values are not identified and therefore not appropriately recognised or protected:

*'[Water sharing plans] are not about meaningful protection of Aboriginal water values. They refer to Aboriginal values but not in a real way. They take no account of our natural water rights, our access to the resources, and how it's part of our culture and heritage ... not having access to this water impacts on our health and well-being. It impacts on our authority and is demeaning for Aboriginal people.'*<sup>340</sup>

The limited Aboriginal engagement undertaken during the development and implementation of the Plans has hampered better understanding and protection of values. The background documents note that the Interagency Regional Panel held one meeting with Bega Local Aboriginal Land Council and 'several' subsequent meetings with 'Aboriginal community representatives'. General concerns were noted including loss of water from the river, poor water quality, reduced numbers of fish and wildlife and the loss or degradation of wetlands.<sup>341</sup>

Stakeholder engagement undertaken for this review identified several additional Aboriginal water values and barriers to water rights and interests. The Yuin Peoples are characterised by strong connections to water – as described below:

*'Waterways are critical parts of our stories, our livelihoods, our culture – but so often ignored, not identified or protected. And it's more than just water. We have holistic pictures, it's all connected. High value cultural areas include campgrounds and connections ... groundwater is also really important – but not considered well. There are really important subterranean connections that can stretch over different areas and across storylines. Women's business is also critical and so connected to water ... waterholes, rivers, creek, springs, birthing areas – water is life giving.'*<sup>342</sup>

*'We are coastal people. We rely on the water for our health, community, food, livelihoods.'*<sup>343</sup>

The waterways and estuaries and the areas surrounding these are of high value to Aboriginal people – they provide ongoing connection to country and culture, ceremony sites, significant

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<sup>337</sup> Part 2 Clause 10(c) of the Bega Brogo Plan; Part 2 Clause 10(b) of the Murrah-Wallaga and Towamba plans.

<sup>338</sup> Part 2, Division 2 Clause 12(j) of the Bega Brogo Plan; Part 2, Division 2 Clause 12(j) of the Murrah-Wallaga and Towamba.

<sup>339</sup> Part 2, Clause 11(m) of the Bega Brogo Plan: 'to provide for the issuing of subcategory "Aboriginal cultural" access licences and "Aboriginal community development" access licences'.

<sup>340</sup> Interview: Councillor, NSW Aboriginal Land Council, 1 February 2021.

<sup>341</sup> Office of Water (2011) *Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources – Background document*. Available at: [http://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0006/547287/wsp\\_bega\\_background.pdf](http://www.water.nsw.gov.au/__data/assets/pdf_file/0006/547287/wsp_bega_background.pdf).

<sup>342</sup> Interview: Graham Moore, Yuin man, 2 February 2021.

<sup>343</sup> Interview: Yuin man, Narooma, 3 February 2021.

women's and men's business areas, social gathering, educational, and recreational areas, as well as critical water and food sources (see **Box 4** and **Appendix E** for further details) .

#### Box 4: Importance of supporting cultural fishing on the south coast

Fish and fishing is central to Yuin people and helps to:

- maintain a strong spiritual connection with country, culture and identity that supports social connections, self-esteem, and mental health
- practise culture and pass on knowledge from one generation to the next (e.g. cultural laws on only taking as much as you need, taking species based on size and season)
- share catch within and between families and communities strengthening social ties and the social safety net for many families with low incomes
- spend time with family and friends on country as a social, recreational and physical activity
- provide subsistence through cheap, healthy food, some medicines, discretionary incomes.<sup>344</sup>

#### Actions that can support Aboriginal fishing values include:

- better recognition of fishing rights under native title
- commence Section 21AA of the Fisheries Management Amendment Act 2009 (NSW) as recommended by the Aboriginal Fishing Advisory Council
- increase commercial fishing licences and shares made available to Aboriginal people
- support Aboriginal fishing enterprises
- increase Aboriginal people involved and employed in land and sea management
- increase access to waterways to enable Aboriginal fishing<sup>345</sup>

There is much evidence and research on Aboriginal values throughout the Plan areas that could be effectively drawn on in developing the replacement Plans. Most recorded Aboriginal sites are concentrated along the coastal zone and estuaries.<sup>346</sup> Wallaga Lake, Beauty Point, Camel Rock, Mogareeka, Black Ada Swamp, Black Range, Jellat Jellat, Merimbula, Pambula River and Twofold Bay have the highest concentrations of known archaeological sites.<sup>347</sup> The dominant

<sup>344</sup> Summarised from the following research: Smyth, L., Egan, H. and Kennett, R. (2018) *Livelihood values of Indigenous customary fishing*. Final report to the Fisheries Research and Development Corporation, Canberra; Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS) (2018) *Aboriginal Fishing Values of the South Coast of NSW: Community Report for the Livelihood Values of Indigenous Cultural Fishing Project*, February; Roberts, A. (2010) *Aboriginal Women's Fishing in New South Wales: A thematic history*. This publication had input from Kath Schilling and published by Department of Environment, Climate Change and Water NSW.

<sup>345</sup> Summary of actions put forward as part of the Livelihood Values of Indigenous Cultural Fishing Project: Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS) (2018) *Aboriginal Fishing Values of the South Coast of NSW: Community Report for the Livelihood Values of Indigenous Cultural Fishing Project*, February

<sup>346</sup> The proximity to waterfront locations means that many of these high value sites are recorded in the Aboriginal Heritage Information Management System as required for development activities. Most recorded coastal sites are less than 3,000 to 4,000 years old as sites older than this are likely submerged due to rising seas up to 6,000 years ago. Two sites, Bass Point and Burrill Lake date to 17,000 and 20,000 years ago respectively and would have been located 14 kilometres inland prior to the sea level rise (Sullivan, M. and Hughes, P. (2006) *Assessment of the Pambula River Estuary Shell Midden, Far South Coast NSW*. Unpublished report for National Parks and Wildlife Service, Merimbula).

<sup>347</sup> Bega Valley Shire Council (2010) *Stage Three A: Aboriginal Cultural Heritage Study*; report prepared with the NSW National Parks and Wildlife Service and the Aboriginal People of the Monaro.

site types are artefact scatters, middens and combined midden/campsites. Coastal shell middens comprise mainly shellfish remains of meals, including estuarine species (whelks, cockles/bimbulas, rock oyster) and some rock platform species (mussel, abalone, limpets, turban and triton shells).

However, there are many more sites containing value to the Aboriginal community that are yet to be recorded or rediscovered. The *Bega Valley Shire Aboriginal Cultural Heritage Study 2010* identifies 296 places of cultural values to the Aboriginal community – this is based on the Aboriginal Heritage Information Management System (AHIMS), and oral and documented history. The study identified three types of high value areas:

- a combination of pre- and post-contact cultural heritage values<sup>348</sup>
- archaeological values, unaccompanied by oral or documented historical accounts<sup>349</sup>
- known documented and oral history, without recorded archaeological sites.<sup>350</sup>

Importantly, these places have been integrated in the 2013 Bega Valley Shire Council Development Control Plan and the 2013 Local Environmental Plan<sup>351</sup> to ensure that high value areas are considered and assessed appropriately as part of any development activities.<sup>352</sup>

The impacts of not having access and rights to water are extensive and ongoing for Aboriginal peoples of the South Coast. There are several critical barriers to Aboriginal peoples' ability to protect Aboriginal values, rights and interests to water in the South Coast including:

- **Lack of access to waterways:** 'Tilba lake used to have a public road, now people bought land around it, so don't know how to access it, but it's significant lake for prawn season.'<sup>353</sup> '[There are] many cases of us owning parcels of land that are then surrounded by private land so can't actually use it ... or where they can get to it, these areas are popular and there is tension over its use'.<sup>354</sup>
- **Lack of ability to use water and its resources:** '[There is a] disconnect with ability to use water ... We can't afford the pumps to actually draw on the water ... [LALCs] do not have the money to access the things *they need to really own land and water and use it*.<sup>355</sup>' Currently

<sup>348</sup> Areas include: Wallaga Lake foreshore and lake entrance including Camel Rock Reserve; Merrimans Island Historical Aboriginal Reserve #43648 [now Aboriginal Place]; Snake Island Historical Aboriginal Reserve #40698 [National Park]; Narara Creek and Beauty Point; Bermagui township and River; Bermagui Historical Aboriginal Reserve #86062 [Aboriginal Owned]; Mumbulla Mountain [Aboriginal Place and National Park]; Wallagoot; Mogareeka; Jellat Bega; Black Range Bega; Tathra Historical Aboriginal Reserve #20; Cohen's Lake Historical Aboriginal Reserve #21; Pambula River; Curalo Lake, Eden; Kiah Historical Aboriginal Reserve #87736 [Aboriginal Owned]; Boydtown; Davidson Whaling Station; Greenglades, Wonboyn.

<sup>349</sup> Areas include: Merimbula township and lake; Wallagoot Lake; Nadgee; Nelsons Beach and Lagoon. The study recommended that these places be further examined in terms of contemporary associations.

<sup>350</sup> Areas include: Wandella; Cobargo township; Dry River, Quaama; Barragga; The Murrumbidgee; Stoney Creek, Bega; Murrays Flat; Bega Historical Reserve #85253; Tarraganda; North Bega; Black Fellows Lagoon; Tathra Aboriginal Reserve #20; Cohen's Lake Aboriginal Reserve #21; Kiah River and Inlet; Mt Imlay. It is recommended that these places have archaeological surveys, prior to determining management arrangements.

<sup>351</sup> Bega Valley Shire Council (2020) *Bega Valley Development Control Plan (2013), updated 2020*. Available at: [https://begavalley.nsw.gov.au/cp\\_themes/default/page.asp?p=DOC-YIZ-77-52-33](https://begavalley.nsw.gov.au/cp_themes/default/page.asp?p=DOC-YIZ-77-52-33); Bega Valley Shire Council (2021) *Bega Valley Local Environmental Plan (2013), updated February 2021*. Available at: <https://www.legislation.nsw.gov.au/view/html/inforce/current/epi-2013-0408>.

<sup>352</sup> High likelihood of high value areas are identified within: 500 metres of identified Aboriginal travel routes; 500 metres of natural waterbodies and watercourses; 500 metres from major waterways; 1 kilometre from estuaries; 1 kilometre from the coast.

<sup>353</sup> Interview: Yuin man, Narooma, 3 February 2021.

<sup>354</sup> Interview: Graham Moore, Yuin man, 2 February 2021

<sup>355</sup> Interview: Graham Moore, Yuin man, 2 February 2021

Aboriginal and native title rights to fish are treated at the same level or worse than recreational fishing'.<sup>356</sup>

- Inconsistent and inadequate engagement in water planning and management: 'the water space has been frustrating on the whole. When you put all that time and effort in and it goes nowhere. Again and again...they also need to be engaging all knowledge holders, not only Elders or Traditional Owners, but range of others and Local Aboriginal Land Councils'.<sup>357</sup>
- Limited awareness and understanding of water legislation and policy: 'Education is critical to make engagement meaningful and to get meaningful outcomes ... There has not been enough knowledge of water policy for anyone to engage in meaningful ways'.<sup>358</sup>
- Social, well-being and health determinants: 'all our social and health and well-being issues are also barriers to us actually managing and accessing land and water as we want and need to. This is important to recognise'.<sup>359</sup>

### 8.3 Licences are difficult to access and use

'Aboriginal cultural' specific purpose access licences are usually granted in inland and coastal surface water and groundwater systems and are included in all Plans. However, water can only be used for traditional cultural purposes (not commercial or trading activities),<sup>360</sup> only in certain water sources, and allocations are capped at up to 10 ML per licence per year.<sup>361</sup>

The Plans also include 'Aboriginal community development' access licences, which can be used for commercial activities in some coastal catchments with higher, more reliable flows.<sup>362</sup> In contrast to other licences in these Plans, Aboriginal community development licences can only be provided for B or C Class flows and for very limited management zones and restricted total share amounts.<sup>363</sup> These limitations inhibit any meaningful commercial uses. For example, accessing B Class flows requires large upfront costs, and under current rules, precludes the use of farm dams. The licences are also for relatively small volumes of water, which means that many commercial operations would be unviable.

This review has not identified any instances where either of these licences have been issued under the Plans. As noted in other water sharing plan reviews, DPIE-Water has not provided evidence of a clear process for accessing and applying for these licences, and Aboriginal stakeholders have limited awareness of their existence, and no resources to enable their use. As described by stakeholders below:

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<sup>356</sup> Interview: Councillor, NSW Aboriginal Land Council, 1 February 2021.

<sup>357</sup> Interview: Graham Moore, Yuin man, 2 February 2021

<sup>358</sup> Interview: Graham Moore, Yuin man, 2 February 2021

<sup>359</sup> Interview: Graham Moore, Yuin man, 2 February 2021.

<sup>360</sup> 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.

<sup>361</sup> See Part 8, Clause 54(5); Part 7, Clause 35(3); Clause 36(4).

<sup>362</sup> 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.

<sup>363</sup> Moggridge, B. (2010) notes that targeted consultation by the Department identified that the amount of water sources prohibiting Aboriginal Community Development Licenses is very restrictive.

*'[Aboriginal water licences are] still limited in use to communal and cultural activities. They're hardly applied for that I know of, and really no one knows about the process in government around this'.<sup>364</sup>*

*'We can't afford the licences. Aboriginal land councils own vast stretches of land along waterways but cannot afford to run the work they do, let alone buy water licences. I don't know any cases of people buying these. Is there even a process? What does the licence mean in terms of use? They are meaningless'.<sup>365</sup>*

The Commission's water sharing plan reviews continually find 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 options with Aboriginal stakeholders that meet a range of identified needs (cultural, environmental, social and economic uses) and consider different volumetric, non-volumetric and non-licensed solutions, and trading and commercial options. Any controlled allocations need to consider Aboriginal water needs prior to allocating water to others, which is inconsistent with the Act and the objectives of the Plans.

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<sup>364</sup> Interview: Councillor, NSW Aboriginal Land Council, 1 February 2021.

<sup>365</sup> Interview: Graham Moore, Yuin man, 2 February 2021.

## 8.4 Recommendations

<p><b>R 13 - All Plans</b></p>	<p>DPIE-Water should amend all Plans to acknowledge the registered native title claim for the South Coast People. Sufficient additional time should be allowed to undertake detailed engagement with Traditional Owners on options to support these values and uses (including fishing) and make any final amendments.</p>
<p><b>R 14 - All Plans</b></p>	<p>In order to better achieve cultural outcomes, by 1 July 2023, DPIE-Water should:</p> <ul style="list-style-type: none"> <li>a) identify and protect known high value cultural sites in the replacement Plans</li> <li>b) undertake further work with a range of Aboriginal knowledge holders, including Aboriginal women, to better understand water values and uses (including fishing), identify and protect them, and better support water access and use.</li> <li>c) ensure that where additional allocations become available within the south coast Plans the Aboriginal water needs including any cultural water allocations are assessed as a priority.</li> <li>d) undertake state-wide actions identified in previous Commission water sharing plan reviews<sup>366</sup> to improve consideration and respect for native title and Aboriginal values in water sharing plans and ensure these are included in the NSW Aboriginal Water Strategy</li> </ul>

<sup>366</sup> At a minimum, include actions to:

- Establish common provisions to undertake preliminary amendments to a plan within six months of a registered native title claim or determination. Allow for additional time to undertake detailed engagement with Traditional Owners to make any specific water allocations and final amendments to the plan required.
- Proactively consider native title claims, Indigenous Land Use Agreements or other land and water agreements wherever possible as part of the planning, drafting and engagement process for plans
- Work to identify Aboriginal values and uses, objectives and outcomes in all plan areas through extensive engagement with local Aboriginal knowledge holders including Aboriginal women – include linked strategies, indicators and monitoring plans to ensure these are met
- Use well-evidenced cultural flow and country-based principles and processes for identifying, protecting, and monitoring Aboriginal water values and outcomes
- Co-design options to support a wide range of cultural, environmental, social and economic water values and uses – e.g. volumetric allocations from unallocated flows; water purchase or transfer of licenses; improved licensing; other water custodianship that is non-volumetric/non-licensed; commercial and trading options
- Identify and support the appropriate infrastructure, resources and education needed to support Aboriginal water access and use
- Co-design and deliver awareness-raising, capability-building and education measures on water sharing, planning and management in NSW
- Support Aboriginal ownership, management and leadership in water and ensure this is well-resourced – to help meet Closing the Gap targets
- Consider, prioritise and commit to changes to legislation and policy that are needed to support these actions



## 9 Opportunities to improve MER and implementation

The Commission's previous water sharing plan audits and reviews have highlighted issues regarding MER, as well opportunities to improve plan development and implementation to ensure plan remakes are successful. These issues are recurring and consistent state-wide.

The Commission considers that previous recommendations in this space should continue to be addressed to ensure plan remakes are successful and demonstrate outcomes. This section provides a high-level summary of these issues. More detailed analysis of these issues and recommendations can be found in previous reviews.<sup>367</sup>

### 9.1 Strengthening MER

As with other water sharing plans, there is limited MER, making it difficult to measure effectiveness and allow for adaptive management to improve outcomes. Reoccurring issues identified state-wide include:

- lack of plan-specific MER frameworks
- poorly defined outcomes, objectives, strategies and performance indicators are not clearly defined, which are not specific, measurable, achievable, relevant and time-bound (SMART) and contain gaps
- significant gaps in the evidence base for provisions
- unclear roles and responsibilities and no clearly documented procedures for implementing MER
- limited use of adaptive management provisions
- limited metering to inform MER.

DPIE-Water has been addressing some gaps in the implementation of MER for coastal water sharing plans, including work to improve environmental MER in coastal areas, funding a new implementation unit and work to improve plan objectives (largely focussed on inland plans but can be expanded to coastal areas in the future). DPIE-Water also advised that it is currently developing an overarching evaluation framework and monitoring plans for water sharing plans. As previously recommended, DPIE-Water should continue these efforts, ensuring that the issues raised above are addressed.

South Coast Plan areas were recently affected by fire which had significant impacts on communities and the condition of catchments and aquatic ecosystems (**Section 6.7**). Ongoing monitoring to understand the impacts of fire effect catchments should be prioritised and adequately resourced, including (but not limited to) monitoring of erosion and water quality in fire affected catchments, identification of affected species and the flow requirements that support fire effected species. DPIE Water should collaborate with DPIE Fisheries and EES to better understand the impacts of bushfires on aquatic species and determine any specific monitoring requirements that should inform Plan provisions and triggers for emergency amendments going forward.

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<sup>367</sup> Previous water sharing plan reviews can be found on the Commission's website:  
<https://www.nrc.nsw.gov.au/wsp-reviews>

The Commission acknowledges that there are currently limited resources for MER and understands DPIE-Water is working to prioritise MER activities. The Commission supports work to identify efficiencies, focus on the most critical MER, integrate with existing MER programs and coordinate monitoring activities with other agencies. MER and reporting systems that are publicly available should be prioritised to demonstrate accountability for this requirement under the Act.

## 9.2 Strengthening implementation

While implementation is assessed under the Section 44 implementation audits, several opportunities to improve implementation are regularly raised in water sharing plan reviews as being critical to the success of plans and the achievement of outcomes.<sup>368</sup> Key opportunities include:

- Strengthen communication and education – there is often low stakeholder understanding of plans, creating opportunities for community mistrust, tension and non-compliance. Plans should be written to be accessible and easily understood, and government education programs and guidance material should be improved to effectively communicate plan elements.
- Implement clear, consistent and appropriate governance – previous reviews and audits have found several instances in which the water sharing plans and supporting actions were not implemented. To avoid this, it is important that planned actions are supported with clear governance, particularly well-defined and feasible roles, responsibilities and timeframes for actions. Water governance is also seen as confusing to many stakeholders. Given current governance and review arrangements 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, including the MER framework.
- Develop community relationships and capacity – many stakeholders consider that the NSW Government should lead more active and inclusive engagement on water. 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. 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. While there are often limited resources to undertake a high level of active engagement, 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.

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<sup>368</sup> Previous water sharing plan reviews can be found on the Commission's website: <https://www.nrc.nsw.gov.au/wsp-audits>.

### 9.3 Recommendation

<b>R 15* - All Plans</b>	By 1 July 2023, to improve MER and Plan implementation continue to implement state-wide recommendations and suggested actions made in previous Commission water sharing plan reviews (see for reference R 18 and SA G-K in the Commission's <i>Review of the water sharing plans for the Richmond and Tweed unregulated and alluvial water sources - Final Report</i> ).
<b>SA C - All Plans</b>	DPIE-Water work with other agencies, including DPIE-Fisheries and DPIE-EES to implement MER programs to examine bushfire impacts and potential implications for plan rules to aid recovery of aquatic ecosystems.

## 10 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 some **recommendations** as outlined below:

- **Recommendation 2:** 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 sustainable fixed, numeric LTAAELs, ensuring they are based on best available information, including ecological requirements, an accurate estimate of basic landholder rights and climate change.
- **Recommendation 6:** To ensure estuary condition is maintained in the Plan areas, DPIE-Water should:
  - a) by 1 July 2023, establish clear objectives and estuarine flow requirements for estuaries across the Plan areas
  - b) by 1 July 2023, include provisions to achieve the estuarine flow requirements defined in (a), including clear agency responsibilities
  - c) use data from the DPIE-EES estuarine monitoring program and NSW Food Authority to monitor estuarine condition and identify changes to estuarine condition that may be impacted by the Plans. Plan provisions should be adjusted as required to ensure that there is sufficient planned environmental water to respond to the needs of these estuaries.
- **Recommendation 7:** By 1 July 2023, to ensure threatened species and endangered ecological communities are protected, DPIE-Water should:

- a) finalise work to establish environmental flow requirements<sup>369</sup> for coastal aquatic species and ensure that plan rules adequately protect them
  - b) amend plan rules (for example, cease to pump rules and TDELs) where evidence indicates unacceptable impact on low flows.
  - e) update any necessary plan provisions to account for protection of threatened species where updated HEVAE assessment and extraction pressure information identifies that current rules are insufficient.
- **Recommendation 8:** By 1 July 2023, to improve the management of connectivity to protect water sources and dependent ecosystems, 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 in (a) as being highly connected and stage access rules for existing bores
    - c) determine the level of connectivity between the aquifers and rivers in the Plans and Coastal Sands aquifers and, if highly connected, provide protection.
  - **Recommendation 10:** To ensure environmental flows and drought reserves from Cochrane Dam deliver environmental and social outcomes downstream, DPIE-Water should:
    - a) in order to inform the remake of the Bega Brogo Plan, as part of the *South Coast Regional Water Strategy*, use best available information to investigate the need and options to increase the Cochrane Dam drought reserve, including consideration of:
      - the adequacy of the drought reserve volume for a range of climatic scenarios
      - revising the definition and triggers (for storing and release) of the drought reserve
      - lessons from the recent drought (including system losses) and up to date data on environmental and critical human needs.
    - b) review daily flow releases from Cochrane Dam (including current timing and release volumes) based on a better understanding of environmental needs and the latest flow data.
    - c) by 1 July 2023, as part of the Bega Brogo Plan replacement:
      - include any necessary changes to provisions based on (a) and (b)
      - formalise the flow targets at Kanoona currently outlined but not included as a provision in the Plan
      - ensure roles and responsibilities for reserve and releases are clearly stated in the Plan.

**Recommendation 2(a)** 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.

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<sup>369</sup> Flow requirements may include any part of the flow duration curve that is a low flow, large fresh or small fresh

The Commission also notes that allowing trading of access licences from extraction management units or flow class where the LTAAEL exceeds the environmental needs to those with capacity for increased extraction can achieve improved environmental outcomes and the same economic outcome without compensation.

**Recommendations 6 and 7** 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 8 (b)** 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.

**Recommendation 8(c)**: may result in a change to access rules to allow for improved environmental protection based on new information regarding connectivity.

**Recommendation 10**: Cochrane Dam is a privately held dam used for generating electricity. Any changes to the drought reserve or environmental releases may have an impact on the dam owner and may require compensation. Those changes would be due to new information where they are based on improved understanding of environmental flow needs, and on climate change where they are based on improved estimates of climate impacts.

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 A1: Objectives, strategies and indicators in the Bega Brogo Plan

Plan objectives <sup>1</sup>	Plan strategy <sup>2</sup>	Plan performance indicator <sup>3</sup>
<p>The vision of this Plan is that these water sources and the water dependent ecosystems will be protected and enhanced, whilst the social, cultural and economic future of the catchment community is recognised and fostered.</p>		
<p>10 (1) The objectives of this Plan for these water sources are to:</p>		
<p>(a) manage the water sources of the Bega Valley that are covered by this Plan in a way that recognises the interaction between the regulated river and unregulated river water sources and their alluvial groundwater</p>	<p>(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</p>	<p>(a) change in low flow regime (b) change in moderate to high flow regime (c) change in groundwater extraction relative to the long-term average annual extraction limit (e) change in, or maintenance of the ecological value and condition of these water sources and dependent ecosystems, including the Bega Estuary</p>
<p>(b) protect, preserve, maintain and enhance the important river flow dependent and high priority groundwater dependent ecosystems of these water sources</p>	<p>(l) establish rules for the location of new bores to protect groundwater dependant ecosystems,</p>	<p>No performance indicator available</p>
<p>(c) protect, preserve, maintain and enhance the Aboriginal, cultural and heritage values of these water sources</p>	<p>(m) provide for the issuing of subcategory “Aboriginal cultural” access licences and “Aboriginal</p>	<p>(h) the extent to which native title rights requirements have been met (j) the extent of recognition of spiritual, social and</p>

<sup>1</sup> Clause 10 of the Plan.

<sup>2</sup> Clause 11 of the Plan.

<sup>3</sup> Clause 12 of the Plan.

	community development" access licences,	customary values of water to Aboriginal people
(d) protect basic landholder rights	(b) identify water requirements for basic landholder rights	(f) the extent to which basic landholder rights requirements have been met
(e) manage these water sources to ensure equitable sharing between users	(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 (g) the extent to which local water utility requirements have been met
(f) provide opportunities for market-based trading of access licences and water allocations within sustainability and system constraints	(i) establish access licence dealing rules	(i) the change in economic benefits derived from water extraction and use
(g) provide water allocation account management rules which allow sufficient flexibility to encourage responsible use of available water	(o) establish access licence dealing rules to provide flexibility for users without adversely impacting on water sources	No performance indicator available
(h) contribute to the maintenance of water quality		(k) improvement of water quality to support environmental values of these water sources
(i) provide recognition of the connectivity between surface water and groundwater		No performance indicator available
(j) adaptively manage these water sources	(j) establish performance indicators (k) identify triggers for and limits to	No performance indicator available



changes to the rules in this Plan		
(k) contribute to the maintenance of estuarine processes and habitats		No performance indicator available
(l) maintain a contribution of flows from upstream water sources to downstream water sources		No performance indicator available
(m) 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) (NWI)		No performance indicator available
In addition to subclause (1), the objectives of this Plan for the Bega and Brogo Regulated Rivers Water Source are to:		
(a) protect the natural seasonal variation of low flows during dry periods	(q) establish rules for the operations of Brogo Dam and the Bega and Brogo Regulated Rivers Water Source	(a) change in flow regime (e) change in, or maintenance of the ecological value and condition of these water sources and dependent ecosystems, including the Bega Estuary
(b) mitigate the impacts of instream structures		No performance indicator available
(c) maintain a highly reliable supply of water to towns	11(p) protect water for critical human needs through the Cochrane Dam Drought Reserve	(d) change in local water utility access (g) the extent to which local water utility requirements have been met

<p>(d) provide clarity of rights for holders of regulated river (high security) access licences and regulated river (general security) access licences</p>	<p>11(r) ensure that the impact of reduced water availability in the regulated river is shared between regulated river (high security) access licences and regulated river (general security) access licences</p>	<p>No performance indicator available</p>
<p>e) provide clarity of access to uncontrolled flows and for supplementary water access licences</p>		<p>No performance indicator available</p>
<p>(3) In addition to subclause (1), the objectives of this Plan for these water sources, excluding the Bega and Brogo Regulated Rivers Water Source, are to:</p>		
<p>(a) preserve and maintain the natural functions of pools particularly during dry periods, which includes the natural rates of drying</p>		<p>(a) change in low flow regime (e) change in, or maintenance of the ecological value and condition of these water sources and dependent ecosystems, including the Bega Estuary</p>
<p>b) preserve and maintain the functions of very low flows</p>		<p>(e) change in, or maintenance of the ecological value and condition of these water sources and dependent ecosystems, including the Bega Estuary</p>
<p>(c) allow for water trading to help shift reliance on extraction from low flows towards greater reliance on extraction from high flows</p>	<p>(n) provide for the conversion of unregulated river access licences to unregulated (high flow) access licences to reduce pressure on low flows and improve river health</p>	<p>(i) the change in economic benefits derived from water extraction and use</p>

**Table A2: Objectives and indicators used for the Murrumbidgee Plan area**

Plan objectives <sup>4</sup>	Plan strategy <sup>5</sup>	Plan performance indicator <sup>6</sup>
<p>The vision of this Plan is to provide for healthy and enhanced water sources and water dependant ecosystems and equitable water sharing among users in the Murrumbidgee Area Unregulated and Alluvial Water Sources.</p>		
<p>(a) protect, preserve, maintain and enhance the important river flow dependent and high priority groundwater dependent ecosystems of these water sources</p>	<p>(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</p>	<p>(a) change in low flow regime (b) change in moderate to high flow regime (c) change in groundwater extraction relative to the long-term average annual extraction limit (d) change in local water utilities access (e) change in, or maintenance of, ecological value of key water sources and their dependent ecosystems</p>
<p>10(b) protect, preserve, maintain and enhance the Aboriginal, cultural and heritage values of these water sources</p>		<p>12(h) the extent to which native title rights requirements have been met 12(j) the extent of recognition of spiritual, social and customary values of water to Aboriginal people.</p>
<p>10(c) Protect basic landholder rights</p>	<p>(b) identify water requirements for basic landholder rights</p>	<p>12(f) the extent to which basic landholder rights requirements have been met</p>
<p>10(d) manage these water sources to ensure equitable sharing between users</p>	<p>(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</p>	<p>12(g) the extent to which local water utility requirements have been met</p>

<sup>4</sup> Clause 10 of the Plan.

<sup>5</sup> Clause 11 of the Plan.

<sup>6</sup> Clause 12 of the Plan.

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(i) the change in economic benefits derived from water extraction and use
10(f) provide water allocation account management rules with sufficient flexibility to encourage responsible use of water		No performance indicator
10(g) contribute to the maintenance of water quality		No performance indicator
10(h) provide recognition of the connectivity between surface water and groundwater		No performance indicator
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
10(j) contribute to the environmental and other public benefit outcomes identified under the Water Access Entitlements and Planning Framework in the <i>Intergovernmental Agreement on the National Water Initiative (2004)</i> (NWI)		No performance indicator

**Table A3: Objectives and indicators used for the Towamba Plan areas**

Plan objectives <sup>7</sup>	Plan strategy <sup>8</sup>	Plan performance indicator <sup>9</sup>
The vision of this Plan is to provide for healthy and enhanced water sources and water dependant ecosystems and equitable water sharing among users in the Towamba River Unregulated and Alluvial Water Sources		
(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	(a) change in low flow regime (b) change in moderate to high flow regime (c) change in groundwater extraction relative to the long-term average annual extraction limit (d) change in local water utilities access (e) change in, or maintenance of, ecological value of key water sources and their dependent ecosystems
(b) protect, preserve, maintain and enhance the Aboriginal, cultural and heritage values of these water sources		(h) the extent to which native title rights requirements have been met (j) the extent of recognition of spiritual, social and customary values of water to Aboriginal people.
(c) protect basic landholder rights	(b) identify water requirements for basic landholder rights	(f) the extent to which basic landholder rights requirements have been met

<sup>7</sup> Clause 10 of the Plan.

<sup>8</sup> Clause 11 of the Plan.

<sup>9</sup> Clause 12 of the Plan.

Plan objectives <sup>7</sup>	Plan strategy <sup>8</sup>	Plan performance indicator <sup>9</sup>
(d) manage these water sources to ensure equitable sharing between users	(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	(g) the extent to which local water utility requirements have been met
(e) provide opportunities for market-based trading of access licences and water allocations within sustainability and system constraints	(i) establish access licence dealing rules	(i) the change in economic benefits derived from water extraction and use
(f) provide water allocation account management rules with sufficient flexibility to encourage responsible use of water		No performance indicator
(g) contribute to the maintenance of water quality		No performance indicator
(h) provide recognition of the connectivity between surface water and groundwater		No performance indicator
(i) adaptively manage these water sources	(j) establish performance indicators, and (k) identify triggers for and limits to changes to the rules in this Plan	No performance indicator
(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) (NWI).		No performance indicator

## Appendix B – Water sources

**Table B1: Bega Brogo Plan water sources**

Plan area water sources	
Bega River Catchment Extraction Management Unit	<ul style="list-style-type: none"> <li>○ Mid Bega River Tributaries Water Source (I) (E)</li> <li>○ Mid Bega River Sands Water Source (E)</li> <li>○ Upper Bega/Bemboka Rivers Water Source</li> <li>○ Upper Bega/Bemboka Rivers Tributaries Water Source (I)</li> <li>○ Candelo Creek Water Source (E)</li> <li>○ Sandy Creek Water Source (I) (E)</li> <li>○ Tantawangalo Creek Water Source (I) (E)</li> <li>○ Lower Bega/Lower Brogo Rivers Tributaries Water Source (I) (E)</li> <li>○ Upper Brogo River Water Source (I)</li> <li>○ Wolumla Creek Water Source (E)</li> <li>○ Bega River Estuary and Tributaries Water Source (I)</li> </ul>
Bega and Brogo Regulated Rivers Extraction Management Unit	<ul style="list-style-type: none"> <li>○ Bega and Brogo Regulated Rivers Water Source (I) (E)</li> </ul>

Note: (I) denotes high in-stream value; (E) denotes high level of economic significance<sup>1</sup>

**Table B2: Murrah-Wallaga Plan water sources**

Plan area water sources	
Murrah- Wallaga Extraction Management Unit	<ul style="list-style-type: none"> <li>○ Murrah River (I)</li> <li>○ Dry River (E)</li> <li>○ Nelson Lagoon Tributaries (I)</li> <li>○ Middle Lagoon Tributaries (I)</li> <li>○ Wapengo Lagoon Tributaries (I)</li> <li>○ Murrah Estuary Tributaries (I)</li> <li>○ Cuttagee Lake Tributaries (I)</li> <li>○ Barragoot Lake Tributaries (I)</li> </ul>

<sup>1</sup> DPI-Water (2011) *Water Sharing Plan for the Bega Brogo Unregulated, Regulated and Alluvial Water Sources – Background document*. Available at: [https://www.industry.nsw.gov.au/\\_data/assets/pdf\\_file/0009/166833/bega-brogo-background.pdf](https://www.industry.nsw.gov.au/_data/assets/pdf_file/0009/166833/bega-brogo-background.pdf).

- Bermagui River (I)
- Wallaga Lake Tributaries (I)
- Dignams Creek
- Narira Creek
- Bobundra Creek (I)

Note: (I) denotes high in-stream value; (E) denotes high level of economic significance<sup>2</sup>

**Table B3: Towamba Plan water sources**

Plan area water sources	
Towamba River Extraction Management Unit	<ul style="list-style-type: none"> <li>○ Upper Towamba River Water Source (I)</li> <li>○ Jingo Creek Water Source</li> <li>○ Pericoe Creek Water Source</li> <li>○ Wog Wog River Water Source (I)</li> <li>○ Lower Towamba River Water Source (I)</li> <li>○ Myrtle Creek Water Source</li> <li>○ Mataganah Creek Water Source</li> <li>○ Stockyard Creek Water Source (I)</li> <li>○ Towamba Estuary Tributaries Water Source (I)</li> </ul>
Wonboyn-Merrica Rivers Catchment Extraction Management Unit	<ul style="list-style-type: none"> <li>○ Far South Coast Water Source (I)</li> <li>○ Wonboyn River Water Source (I)</li> <li>○ Green Cape Water Source (I)</li> </ul>
Pambula River Extraction Management Unit	<ul style="list-style-type: none"> <li>○ Nullica River Water Source</li> <li>○ Eden Tributaries Water Source</li> <li>○ Curalo Lake and Tributaries Water Source</li> <li>○ Pambula Lake Tributaries Water Source (I)</li> <li>○ Merimbula Lake Tributaries Water Source</li> <li>○ Merimbula Creek Water Source</li> <li>○ Tura Beach Tributaries Water Source</li> <li>○ Sandy Beach Creek Water Source (I)</li> <li>○ Bondi Lake and Tributaries Water Source (I)</li> <li>○ Wallagoot Lake and Tributaries Water Source (I)</li> </ul>

<sup>2</sup> DPI-Water (2016) *Water Sharing Plan for the Murrumbidgee Unregulated and Alluvial Water Sources – Background document*. Available at: [https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0009/166860/murrumbidgee-wallaga-background.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0009/166860/murrumbidgee-wallaga-background.pdf).



Note: (I) denotes high in-stream value; no water sources were classified as having high economic dependence.<sup>3</sup>

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<sup>3</sup> DPI-Water (2010) *Water Sharing Plan for the Towamba River Unregulated and Alluvial Water Sources – Background document*. Available at: [https://www.industry.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0010/166879/towamba-river-background.pdf](https://www.industry.nsw.gov.au/__data/assets/pdf_file/0010/166879/towamba-river-background.pdf).

## Appendix C – Estuaries of the south coast plan area

Estuary	Latitude (°S)	Longitude (°E)	Plan area
Little Lake (Wallaga)	-36.3396	150.1025	Murrah-Wallaga Area Unregulated and Alluvial
Wallaga Lake	-36.3697	150.0799	Murrah-Wallaga Area Unregulated and Alluvial
Bermagui River	-36.4224	150.0731	Murrah-Wallaga Area Unregulated and Alluvial
Baragoot Lake	-36.4641	150.0668	Murrah-Wallaga Area Unregulated and Alluvial
Cuttagee Lake	-36.4880	150.0551	Murrah-Wallaga Area Unregulated and Alluvial
Murrah River	-36.5254	150.0581	Murrah-Wallaga Area Unregulated and Alluvial
Bunga Lagoon	-36.5402	150.0555	Murrah-Wallaga Area Unregulated and Alluvial
Wapengo Lagoon	-36.6285	150.0209	Murrah-Wallaga Area Unregulated and Alluvial
Middle Lagoon	-36.6505	150.0092	Murrah-Wallaga Area Unregulated and Alluvial
Nelson Lagoon	-36.6857	149.9940	Murrah-Wallaga Area Unregulated and Alluvial
Bega River	-36.7018	149.9830	Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial
Wallagoot Lake	-36.7900	149.9600	Towamba River Unregulated and Alluvial
Bournda Lagoon	-36.8202	149.9389	Towamba River Unregulated and Alluvial
Back Lagoon	-36.8833	149.9307	Towamba River Unregulated and Alluvial
Merimbula Lake	-36.8957	149.9228	Towamba River Unregulated and Alluvial
Pambula River	-36.9469	149.9170	Towamba River Unregulated and Alluvial
Curalo Lagoon	-37.0469	149.9223	Towamba River Unregulated and Alluvial
Shadrachs Creek	-37.0768	149.8787	Towamba River Unregulated and Alluvial
Nullica River	-37.0911	149.8729	Towamba River Unregulated and Alluvial
Boydton Creek	-37.1029	149.8819	Towamba River Unregulated and Alluvial
Towamba River	-37.1118	149.9132	Towamba River Unregulated and Alluvial
Fisheries Creek	-37.1107	149.9289	Towamba River Unregulated and Alluvial
Twofold Bay	-37.0775	149.9481	Towamba River Unregulated and Alluvial
Saltwater Creek (Eden)	-37.1685	150.0030	Towamba River Unregulated and Alluvial
Woodburn Creek	-37.1706	150.0052	Towamba River Unregulated and Alluvial
Wonboyn River	-37.2497	149.9662	Towamba River Unregulated and Alluvial
Merrica River	-37.2966	149.9519	Towamba River Unregulated and Alluvial
Table Creek	-37.4063	149.9541	Towamba River Unregulated and Alluvial
Nadgee River	-37.4381	149.9661	Towamba River Unregulated and Alluvial
Nadgee Lake	-37.4688	149.9729	Towamba River Unregulated and Alluvial

Source: Data available via the SEED Portal

## Appendix D – Extraction sensitive environmental assets of the south coast plan area

Water source	Extraction sensitive threatened species	Extraction sensitive endangered ecological communities	Presence of National Park
<b>Bega Brogo Plan</b>			
Upper Brogo River	15		More than 90% of water source
Lower Brogo /Lower Brogo Rivers Tributaries	20		
Bega and Brogo Regulated Rivers	20		
Upper Bega / Bemboka River Tributaries	19		
Bega River Estuary Tributaries	18		
Sandy Creek	18		
Tantagwanglo	19		
Mid Bega River Tributaries	19		
<b>Murrah Wallaga Plan</b>			
Murrah River	15		Significant area of water source
Murrah Estuary Tributaries	14	2	Yes
Nelson Lagoon Tributaries	14	2	Significant area of water source
Middle Lagoon Tributaries	14	2	Significant area of water source
Wapengo Lagoon Tributaries	14	2	Small area of water source
Cuttagee Lake Tributaries	14	2	Yes
Barragoot Lakes Tributaries	13	2	Yes
Bermagui River	14	2	Yes
Wallaga Lake Tributaries	19	2	Yes
Bobundra Creek	19	2	Yes
<b>Towamba Plan</b>			
Upper Towamba River	10		50% of water source area
Wog Wog River	14	2	60% of water source area
Stockyard Creek	10		50% of water source area
Lower Towamba River	15	2	40% of water source area
Towamba Estuary Tributaries	14	2	
Far South Coast	16	2	
Wonboyn River	17	2	Small area of water source
Green Cape	15	2	90% of water source area
Pambula Lake Tributaries	16	2	
Sandy Beach Creek	14	2	60% of water source area
Bondi Lake and Tributaries	13	2	100% of water source area
Wallagoot Lake and Tributaries	14	2	60% of water source area

Source: (NSW Office of Water, 2010) Towamba Background Document; (NSW Office of Water, 2010) Murrah Wallaga Background Document; (NSW Office of Water, 2011) Bega Brogo Background Document

## Appendix E – Case study: Aboriginal fishing on the south coast

### Fishing is central to Yuin as ‘water’ or ‘fish eating’ people – fishing helps to...

- maintain a strong spiritual connection with country, culture and identity that supports social connections, self-esteem, and mental health
- practise culture and pass on knowledge from one generation to the next (e.g. cultural laws on only taking as much as you need, taking species based on size and season)
- share catch within and between families, communities strengthening social ties and the social safety net for families with low incomes
- spend time with family and friends on country as a social, physical, and recreational activity
- provide a subsistence through cheap, healthy food and some medicines, and discretionary incomes.<sup>1</sup>

“I think it’s just a natural thing to enjoy, we like swimming, fishing and diving and all together out having a good time and having a good feed too. It’s a cultural thing, we’ve always done it, and we’ll always do it.”

Ossie Cruse (2009).<sup>2</sup>

Cultural-commercial fishers from the Jessop family beach hauling mullet, Mullimburra Point, NSW

Photographer: Wally Stewart<sup>3</sup>



### Cultural fishing on country is increasingly difficult because...

- environmental changes and pollution have altered fishing conditions e.g. water quality, species
- access to traditional fishing spots is increasingly difficult due to private lands, commercial fisheries operations and fisheries legislation and policy
- legislative and other restrictions on marine areas, fishing and the collection of seafood do not take into account native title or cultural practices and can lead to fines and imprisonment
- section 21AA of the *Fisheries Management Amendment Act 2009* to authorise cultural fishing has not been implemented – despite aligning with other and advice from AFAC<sup>4</sup>
- there are inherent limitations in native title legislation to support Aboriginal fishing rights<sup>5</sup>
- costs to enter the commercial fishing industry are prohibitively high for Aboriginal people<sup>6</sup>



## The impacts of not doing cultural fishing are damaging Yuin culture

'The damage that it is done is massive...there's a high unemployment rate here but they all knew how to fish and relied on that ... and people are getting warned, fined, sent to jail ... it's had such an impact on our mental health, our well-being and diet ... families have broken up and suffered ...

That's how much damage is done to our people. Not just one person, it's the whole community ... you can't put a price on that ... that loss of culture ... nearly severed two generations of fishing.'

Wally Stewart, Yuin man (2021)<sup>7</sup>

### Actions to support Aboriginal fishing values of the South Coast are needed...

- increase commercial fishing licences and shares made available to Aboriginal people
- establish Aboriginal fishing cooperatives and more Aboriginal-owned commercial fishing ventures
- increase Aboriginal people involved and employed in land and sea management (e.g. water rangers), fisheries management and culturally appropriate fisheries enforcement
- recognise and better understand the contribution of cultural-commercial fishers to their communities and the role of women as cultural fishers and food providers
- fully recognise native title rights including fishing rights
- commence Section 21AA of the *Fisheries Management Amendment Act 2009* (NSW) without regulation, in line with advice from the Aboriginal Fishing Advisory Council (AFAC)
- increase access to waterways and water to support culture, connection to country and fishing

Barbecuing mutton fish (abalone) for a community gathering at Narooma, NSW, 19 March 2016.

Photographer: Robert Chewing.<sup>9</sup>



**"It's our native title rights but they just ignore it ... We had to fight tooth and nail to teach kids to fish ... We try to teach them how to look after our resources ... it's our duty to take care of it for our next generation.**

**[The] South Coast economy relies on tourism – if there's no fish no one will come here ... We can get into the water and do this – plan, do skills training, business, and make employment for community ... we need a partnership with fishers, industry and fisheries ... to fix our waters up."**

Wally Stewart, Yuin man (2021)<sup>10</sup>

### Case study notes

1. Summarised from the following research: Smyth, L., Egan, H. and Kennett, R. (2018) *Livelihood values of Indigenous customary fishing*. Final report to the Fisheries Research and Development Corporation, Canberra; Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS) (2018) *Aboriginal Fishing Values of the South Coast of NSW: Community Report for the Livelihood Values of Indigenous Cultural Fishing Project*, February; Roberts, A. (2010) *Aboriginal Women's Fishing in New South Wales: A thematic history*. This publication had input from Kath Schilling and published by Department of Environment, Climate Change and Water NSW.
2. Ossie Cruse 27-10-2009. In Bega Valley Shire Council (2010) *Stage Three A: Aboriginal Cultural Heritage Study*. See: [https://begavalley.nsw.gov.au/cp\\_themes/default/page.asp?p=DOC-LBU-53-36-18](https://begavalley.nsw.gov.au/cp_themes/default/page.asp?p=DOC-LBU-53-36-18)
3. In Smyth, L., Egan, H. and Kennett, R. (2018) *Livelihood values of Indigenous customary fishing*. Final report to the Fisheries Research and Development Corporation, Canberra. See: <https://aiatsis.gov.au/research/current-projects/livelihood-values-indigenous-customary-fishing>
4. The *Fisheries Management Act 1994 (NSW)* includes an objective to 'recognise the spiritual, social and customary significance to Aboriginal persons of fisheries resources and to protect, and promote the continuation of, Aboriginal cultural fishing' – this came into force in an amendment in April 2010. Section 21AA of the *Fisheries Management Amendment Act 2009 (NSW)* provides authorisation for an Aboriginal person to take or possess fish for the purpose of Aboriginal cultural fishing despite Sections 17 and 18 of the Act (which includes a number of offences relating to size, quantity and taking of particular species of fish), subject to the making of regulations on specific restrictions for cultural fishing, in consultation with the Aboriginal Fishing Advisory Council (established under the Act to advise the NSW Minister for Primary Industries).

However, Section 21AA has still not been implemented. This means that Aboriginal people could still be prosecuted for what they consider their traditional cultural practices. Aboriginal cultural fishing must rely on either the 'Aboriginal Cultural Fishing Interim Access' arrangement made in 2014 which allows for limited extensions of bag and possession limits under restricted conditions, or approval of the Minister under Section 37(1)(d) of the Act, or a native title defence in prosecution cases (see further discussion below).

The 29 Members of the Aboriginal Fishing Advisory Council (AFAC) have provided consistent advice that Section 21AA be implemented without regulation.

5. Under the *Fisheries Management Amendment Act 2009 (NSW)*, Aboriginal people charged with statutory offences when exercising cultural fishing practices who plead not guilty must establish a defence to be acquitted. Native title rights, if established by a defendant, are recognised as a defence in Section 211 of the *Native Title Act (Cth) 1993*. However, the ability to defend a charge based on native title rights has varied.

Recent and highly controversial cases on the South Coast NSW show that specific and detailed evidence from community members, elders, and anthropological evidence is needed. The capacity of Aboriginal defendants to obtain legal representation and evidence may be limited due to their social and financial circumstances. Proceedings have been lengthy and costly which may deter Aboriginal defendants from raising a defence. Relevant cases suggest that it would be easier for Aboriginal defendants to rely on Section 21AA (in contrast to native title) as a defence to charges brought against them. Similar statutory provisions for Aboriginal cultural fishing have been enacted in the Northern Territory and Queensland. (See: Pain, N. and Pick, G. (2020) *Balancing Competing Interests in the Criminal Justice System: Aboriginal Fishing Rights in Coastal New South Wales*. *UNSW Law Journal* Vol. 43(4): 1383-1404).

6. Summarised from the following research: Smyth, L., Egan, H. and Kennett, R. (2018) *Livelihood values of Indigenous customary fishing*. Final report to the Fisheries Research and Development Corporation, Canberra; Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS) (2018) *Aboriginal Fishing Values of the South Coast of NSW: Community Report for the Livelihood Values of Indigenous Cultural Fishing Project*, February; Roberts, A. (2010) *Aboriginal Women's Fishing in New South Wales: A thematic history*. This publication had input from Kath Schilling and published by Department of Environment, Climate Change and Water NSW.
7. Interview: Wally Stewart, Yuin man, Narooma, 9am Wednesday 3 February 2021.
8. Summary of actions put forward as part of the Livelihood Values of Indigenous Cultural Fishing Project: Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS) (2018) *Aboriginal Fishing Values of the South Coast of NSW: Community Report for the Livelihood Values of Indigenous Cultural Fishing Project*, February.
9. In Smyth, L., Egan, H. and Kennett, R. (2018) *Livelihood values of Indigenous customary fishing*. Final report to the Fisheries Research and Development Corporation, Canberra. See: <https://aiatsis.gov.au/research/current-projects/livelihood-values-indigenous-customary-fishing>
10. Interview: Wally Stewart, Yuin man, Narooma, 9am Wednesday 3 February 2021.