

Replacement Water Sharing Plan Guide

Version 3 July 2024



Acknowledgement of Country



Department of Climate Change, Energy, the Environment and Water acknowledges the traditional custodians of the land and pays respect to Elders past, present and future.

We recognise Australian Aboriginal and Torres Strait Islander peoples' unique cultural and spiritual relationships to place and their rich contribution to society.

Artist and designer Nikita Ridgeway from Aboriginal design agency – Boss Lady Creative Designs, created the People and Community symbol.

Replacement Water Sharing Plan Guide

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Glossary and abbreviations

Term	Definition
Aquifer	An underground layer of water-bearing permeable rock or unconsolidated materials (gravel, sand, silt or clay) from which groundwater can be usefully extracted. The volume of water stored in an aquifer, the rate at which water can recharge, the volume of water extracted from it, and the rate at which water can move through the aquifer are all controlled by the geologic nature of the aquifer.
Basin Plan	The <i>Basin Plan 2012</i> ; this plan is a piece of legislation that sets the amount of water that users can take from the Murray–Darling Basin each year.
Cap rock	Hard impervious rock overlying and often sealing in a deposit of oil, gas, coal or water.
BLR	Basic landholder right; identified as domestic and stock rights, native title rights and harvestable rights
GDE	Groundwater-dependent ecosystem; an ecosystem that relies on groundwater for their species composition and their natural ecological processes
GL	Gigalitre
LTAEL	Long-term average annual extraction limit; the long-term average annual volume of water (expressed in megalitres per year) in a water source available to be lawfully extracted or otherwise taken under access licences and BLR requirements
Mangrove limit	The point in a river where mangroves can grow due to presence of brackish water from the interaction of saline water from the ocean and freshwater from the river.
ML	Megalitre
NWI	National Water Initiative
Ramsar Convention	The Ramsar Convention on Wetlands of International Importance is a treaty between nations aimed at conserving wetlands.
Replacement plans	Water sharing plans at the end of their 10-year plan term that have not been extended and are undergoing the replacement process. This term also includes those plans that will be replaced in the future.
Share component	An entitlement to a given number of shares of the available water in a specified water source. The share component on an access licence certificate is expressed as a unit share. The share component of a specific-purpose access licence (for example, local water utility, major water utility, and domestic and stock) is expressed in megalitres.
WM Act	<i>Water Management Act 2000</i>

1 Introduction

Water sharing plans are key legal instruments for sharing water in New South Wales (NSW). Each plan is in place for 10 years, after which it may be extended or replaced with a new plan. When a plan is replaced, it is updated to include new information, policy and legislative changes.

This guide outlines the processes that the Department of Climate Change, Energy, Environment and Water (the department) has used in replacing the plans for unregulated river and groundwater water sources. It is an update on the information outlined in the:

- Macro water sharing plans – the approach for unregulated rivers: A report to assist community consultation¹
- Macro water sharing plans – the approach for groundwater: A report to assist community consultation²
- Macro water sharing plans – the approach for unregulated rivers: Access and trading rules for pools.³

These reports were used to guide development of water sharing plans from 2011. We have made changes to the processes for replacing plans as a result of our adaptive approach to planning. As noted throughout this guide, we are still using some methods described in the above reports.

This guide describes planning methods for developing replacement water sharing plans for unregulated coastal and inland areas, and for groundwater outside the Murray–Darling Basin (MDB). It does not discuss planning methods for developing replacement water sharing plans for regulated river sources or groundwater within the MDB. Though it may be updated to include these plans over time.

Although the content in this guide is correct at the time of writing, we are continually updating our methods and policies in response to the latest research and information. You should refer to water sharing plan background documents for the most recent and specific methods used to prepare each plan.

¹ NSW Office of Water, 2011, Macro water sharing plans – the approach for unregulated rivers: A report to assist community consultation, NSW Government. Accessed from: [Macro-water-sharing-plans-the-approach-for-unregulated-rivers](#) (PDF, 646.61 KB)

² NSW Office of Water, 2011, Macro water sharing plans – the approach for groundwater: A report to assist community consultation, NSW Government. Accessed from: [Macro-water-sharing-plants-the-approach-for-groundwater](#) (PDF, 1673.86 KB)

³ NSW Office of Water, 2011, Macro Water Sharing Plans – the approach for unregulated rivers. Access and trading rules for pools. NS Government. Access from: [Macro-water-sharing-plans-the-approach-for-unregulated-rivers](#) (PDF, 620.58 KB)

2 Current status of water sharing plans

2.1 Background of plans

Water sharing plans were developed for rivers and groundwater in NSW after the introduction of the *Water Management Act 2000* (WM Act). These plans establish environmental water rules to protect rivers and groundwater and identify the water requirements for basic landholder rights (BLRs) and for extraction under access licences.

The plans also establish long-term limits on water extraction and rules that govern the access and trade of water. The first plans began in 2004, and plans are now in place for all rivers and groundwater in NSW. Some parts of water sharing plans applying to water sources in the Murray Darling Basin also form part of water resource plans prepared under the *Water Act 2007* and the *Basin Plan 2012* (the Basin Plan).

2.2 Review and replacement process

Under the WM Act, water sharing plans have a 10-year duration. Since 2014, water sharing plans in NSW have been reaching the end of their first 10-year plan term. We have been extending or replacing these plans as they expire.

During the life of a plan, it will undergo review at least twice, as follows:

- the implementation of the plan will be audited in the first five years of the plan under Section 44 of the WM Act,
- the performance of the plan will be reviewed in the last five years of the plan under Section 43A of the WM Act.

The NSW Natural Resources Commission (the Commission) is the independent body that audits and reviews water sharing plans. The Section 44 audits aim to identify where improvements are necessary to implement the plan rules, see the Commission web site for copy of [audits completed](#).

The Section 43A review is to determine whether the plan is achieving the intended environmental, social and economic outcomes. See the Commission web site for copy of [reviews completed](#).

The Commission reports the findings of Section 44 audits and Section 43A reviews to the NSW Water Minister to help decide whether to extend a plan for another 10 years or to replace a plan. If the minister recommends replacing the plan, the department considers the Commission's recommendations when developing the replacement plan.

We extend a plan when the duration of the current plan is prolonged by another 10 years. We replace a plan when a new plan takes the place of a current plan that has expired. The replacement plan may continue some provisions of the plan it is replacing and introduce new

provisions. When a plan is to be replaced, the minister may extend the plan by as long as two years to develop the replacement. 57 provides a list of replaced plans.

This guide refers to plans that have been replaced since 2020, are in the process of being replaced or that are expected to be replaced in the future as ‘replacement plans’.

Under the WM Act, the minister may consolidate one or more management plans. Several plans that have been replaced were consolidated with other plans. 57 also indicates which plans have been consolidated. The ‘Policy updates and legislative changes’ section of this guide discusses the consolidation of plans in more detail.

Table 1 is a schedule of all water sharing plans, their expiry year and proposed replacement year with a 2-year extension.

Table 1. Water sharing plans expiry and replacement (correct at the time of publishing June 2024)

Expiry year (30 June)	Replacement year	Water sharing plan
2022	2024	<p>Coastal plans:</p> <ul style="list-style-type: none"> <u>Water Sharing Plan for the Bega River Area Regulated, Unregulated and Alluvial Water Sources 2024¹</u> <p>Inland plans:</p> <ul style="list-style-type: none"> <u>Water Sharing Plan for the Castlereagh River Unregulated River Water Sources 2011</u> <u>Water Sharing Plan for the Intersecting Streams Unregulated River Water Sources 2011</u> <u>Water Sharing Plan for the Murray Unregulated River Water Sources 2011</u> <u>Water Sharing Plan for the Lower Murray–Darling Unregulated River Water Source 2011</u> <u>Water Sharing Plan for the North Western Unregulated and Fractured Rock Water Sources 2011</u> <u>Water Sharing Plan for the NSW Border Rivers Unregulated River Water Sources 2012</u> <p>Note: The Bega plan was replaced in July 2023 and then replaced again in 2024 to address some administrative errors. Changes were minor and reflect those changes agreed to during public consultation. This ensures the area’s water sharing rules can be properly implemented and enforced under state legislation.</p>
2023	2025	<p>Coastal plans:</p> <ul style="list-style-type: none"> No plans are due to expire in 2023. <p>Inland plans:</p> <ul style="list-style-type: none"> <u>Water Sharing Plan for the Barwon–Darling Unregulated River Water Source 2012²</u>

		<ul style="list-style-type: none"> • <u><i>Water Sharing Plan for the Belubula Regulated River Water Source 2012</i></u> • <u><i>Water Sharing Plan for the Gwydir Unregulated River Water Sources 2012</i></u> • <u><i>Water Sharing Plan for the Lachlan Unregulated River Water Sources 2012</i></u> • <u><i>Water Sharing Plan for the Namoi and Peel Unregulated Rivers Water Sources 2012</i></u> • <u><i>Water Sharing Plan for the Murrumbidgee Unregulated River Water Sources 2012</i></u> • <u><i>Water Sharing Plan for the Macquarie Bogan Unregulated Rivers Water Sources 2012</i></u> <p>²Note: For the Barwon-Darling plan only – the plan was extended for a further two years to allow relevant work to inform the plan replacement.</p>
2026	2028	<p>Coastal plans:</p> <ul style="list-style-type: none"> • <u><i>Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016</i></u> • <u><i>Water Sharing Plan for the North Coast Coastal Sands Groundwater Sources 2016</i></u> • <u><i>Water Sharing Plan for the Macleay Unregulated and Alluvial Water Sources 2016</i></u> • <u><i>Water Sharing Plan for the Clarence River Unregulated and Alluvial Water Sources 2016</i></u> • <u><i>Water Sharing Plan for the Clyde River Unregulated and Alluvial Water Sources 2016</i></u> • <u><i>Water Sharing Plan for the Deua River Unregulated and Alluvial Water Sources 2016</i></u> • <u><i>Water Sharing Plan for the Hunter Regulated River Water Source 2016</i></u> • <u><i>Water Sharing Plan for the Snowy Genoa Unregulated and Alluvial Water Sources 2016</i></u> • <u><i>Water Sharing Plan for the South Coast Groundwater Sources 2016</i></u> • <u><i>Water Sharing Plan for the Tuross River Unregulated and Alluvial Water Sources 2016</i></u> <p>Inland plans:</p> <ul style="list-style-type: none"> • <u><i>Water Sharing Plan for the Gwydir Regulated River Water Source 2016</i></u> • <u><i>Water Sharing Plan for the Lachlan Regulated River Water Source 2016</i></u> • <u><i>Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source 2016</i></u> • <u><i>Water Sharing Plan for the Murrumbidgee Regulated River Water Source 2016</i></u>

		<ul style="list-style-type: none"> • <u>Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources 2016</u> • <u>Water Sharing Plan for the Upper Namoi and Lower Namoi Regulated River Water Sources 2016</u>
2027	2029	<p>Coastal plans:</p> <ul style="list-style-type: none"> • <u>Water Sharing Plan for the Nambucca Unregulated and Alluvial Water Sources 2016</u> <p>Inland plans:</p> <ul style="list-style-type: none"> • No plans are due to expire in 2027.
2030	2032	<p>Coastal plans:</p> <ul style="list-style-type: none"> • <u>Water Sharing Plan for the Bellinger River Area Unregulated and Alluvial Water Sources 2020</u> <p>Inland plans:</p> <ul style="list-style-type: none"> • <u>Water Sharing Plan for the Darling Alluvial Groundwater Sources 2020</u> • <u>Water Sharing Plan for the Gwydir Alluvial Groundwater Sources 2020</u> • <u>Water Sharing Plan for the Lachlan Alluvial Groundwater Sources 2020</u> • <u>Water Sharing Plan for the Macquarie–Castlereagh Groundwater Sources 2020</u> • <u>Water Sharing Plan for the Murray Alluvial Groundwater Sources 2020</u> • <u>Water Sharing Plan for the Murrumbidgee Alluvial Groundwater Sources 2020</u> • <u>Water Sharing Plan for the Namoi Alluvial Groundwater Sources 2020</u> • <u>Water Sharing Plan for the NSW Border Rivers Alluvial Groundwater Sources 2020</u> • <u>Water Sharing Plan for the NSW Great Artesian Basin Groundwater Sources 2020</u> • <u>Water Sharing Plan for the NSW Great Artesian Basin Shallow Groundwater Sources 2020</u> • <u>Water Sharing Plan for the NSW Murray–Darling Basin Fractured Rock Groundwater Sources 2020</u> • <u>Water Sharing Plan for the NSW Murray–Darling Basin Porous Rock Groundwater Sources 2020</u>
2031	2033	<p>Coastal plans:</p> <ul style="list-style-type: none"> • No plans are due to expire in 2031. <p>Inland plans:</p> <ul style="list-style-type: none"> • <u>Water Sharing Plan for the NSW Border Rivers Regulated River Water Source 2021</u>
2032	2034	<p>Coastal plans:</p>

		<ul style="list-style-type: none"> • <u>Water Sharing Plan for the Central Coast Unregulated and Alluvial Water Sources 2022</u> • <u>Water Sharing Plan for the Coffs Harbour Area Unregulated and Alluvial Water Sources 2022</u> • <u>Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2022</u> • <u>Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources 2022</u> <p>Inland plans:</p> <ul style="list-style-type: none"> • <u>Water Sharing Plan for the Peel Regulated River Water Source 2022</u>
2033	2035	<p>Coastal plans:</p> <ul style="list-style-type: none"> • <u>Water Sharing Plan for the Richmond River Area Unregulated, Regulated and Alluvial Water Sources 2023</u> • <u>Water Sharing Plan for the Towamba River Unregulated and Alluvial Water Sources 2023</u> • <u>Water Sharing Plan for the Tweed River Area Unregulated and Alluvial Water Sources 2023</u> • <u>Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources 2023</u> • <u>Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2023</u> <p>Inland plans:</p> <ul style="list-style-type: none"> • No plans are due to expire in 2033.

2.3 Steps for plan replacement

Table 2 outlines the phases for plan replacement and key actions we complete in each phase.

Table 2. Steps for plan replacement

Phase	Description
Phase 1: Department review of water sharing plan	In this phase of plan replacement, we identify key stakeholders that we will consult with, collate known issues from a range of sources, including the section 44 audits, lists of possible amendments and advice from within the department and other agencies. We also consult with a departmental and an interagency working group that provide advice and analysis to inform plan replacement and we conduct targeted stakeholder consultation as necessary.
Phase 2: Natural Resources Commission review of water sharing plan	The Commission reviews the plan and makes recommendations for extension or replacement.

<p>Phase 3: Plan changes and updates</p>	<p>In this phase we update all the data in the current plan, including groundwater-dependent ecosystem (GDE) identification, basic landholder and native title rights, licensed entitlement, flow reference points, flow classes, maps, the risk assessment. Any policy changes since the plan was made are also considered and applied where appropriate.</p> <p>We consider any new information and recommendations of the Commissions review and develop and analyse options for proposed rule changes (including flow, environmental, social and economic analysis where appropriate and data available).</p> <p>Options are considered by the departmental and the interagency working groups. Targeted stakeholder consultation may also occur in this phase to further inform options analysis as required.</p> <p>Proposed changes and updates are finalised to inform development of a draft plan for public exhibition.</p>
<p>Phase 4: Drafting the water sharing plan</p>	<p>The final draft plan is developed in this phase. A clear set of drafting instructions is developed that described the proposed changes and explains why they are being made. The instructions are used to brief our departmental water legal team who use them to draft the plan for public exhibition. This team also apply any changes needed to the way the plan is structured and how its content is framed to make it easier to interpret and clearly within the powers of the WM Act.</p>
<p>Phase 5: Prepare water sharing plan for public exhibition</p>	<p>The final draft plan for public exhibition is reviewed and we seek interagency support to progress to public exhibition through an interagency Regional Water Senior Officers Group.</p> <p>Communication material to support public exhibition is drafted including, maps, factsheets, presentations, submission forms and other supporting documentation as required.</p> <p>The final draft plan and the supporting material then gets departmental approval to proceed to public exhibition.</p> <p>Note: For inland water sharing plans, changes to the water resource plan may also form a part of the information going on public exhibition if needed.</p>
<p>Phase 6: Public exhibition</p>	<p>Public exhibition is launched on the department’s website advising start and end dates, public meeting details and information on how to make a submission.</p> <p>Media releases are made, and advertising is undertaken in local papers and on local radio to advise the public that the plan is on exhibition. Emails and letters are sent to water licence holders and our known list of stakeholders. We also have webinars and often face to face meetings with stakeholders to explain any changes in the plan and how to make a submission.</p> <p>Submissions received are reviewed the issues raised are collated and documented for consideration in finalising the replacement plan.</p>
<p>Phase 7: Update draft water sharing plan</p>	<p>All the issues raised in public exhibition are assessed. Some usually fall out of scope of the plan replacement. Those in scope are considered and where possible addressed. Often options are reassessed and updated recommendations are prepared for a final draft plan.</p> <p>The departmental and the interagency working groups consider any proposed changes to the draft public exhibited plan if required. Some further targeted stakeholder consultation may also occur at this stage as necessary.</p> <p>Drafting instructions are developed for any changes to be made to the public exhibition draft plan. The departmental water legal team then prepare the final draft replacement plan.</p>

	<p>The final draft replacement plan is reviewed, and we seek interagency support to progress to ministers for concurrence and approval through an interagency Regional Water Senior Officers Group.</p> <p>The final draft replacement plan and the supporting material then gets departmental approval to proceed for ministers consideration.</p> <p>Note: For inland water sharing plans, changes to the water resource plan may also form a part of the recommendations made to the ministers.</p>
Phase 8: Water sharing plan approval and gazettal	<p>Where the draft plan creates a new water source a proclamation package is developed for the ministers approval to go to the NSW Governor to approve the proclamation of the new area.</p> <p>The NSW Water Minister considers the draft replacement plan and its supporting material and sends it to the NSW Minister for the Environment seeking their concurrence.</p> <p>Once concurrence is given then the NSW Minister for Water signs the water sharing plan order and the plan is made.</p> <p>Parliamentary Counsel's Office then arranges publication of the new water sharing plan on NSW legislation website.</p>
Phase 9: Preparation for release of water sharing plan	<p>Supporting explanatory material for the new water sharing plan is developed and uploaded onto the department's website, this usually includes a background document and rules summary sheets. The plan and associated maps are also uploaded.</p>
Phase 10: Water sharing plan commencement	<p>The plan commences once it is published on the NSW legislation website, or on the date specified in the plan itself.</p>

2.4 Other drivers of change

Key drivers for changes to the plans include:

- The Commission's review in the second half of the plans' 10-year term.
- *Basin Plan 2012* – water sharing plans are the primary legislative tool to align management of inland water resources with the Basin Plan requirements. Water resource plans are key to implementation of the Basin Plan and build on the requirements in water sharing plans. The water resource plans set a sustainable diversion limit that cannot be exceeded over time. Where the provisions of a water sharing plan meet the requirements of the Basin Plan, the water resource plan references and adopts those provisions. On the other hand, where a water sharing plan does not meet requirements of the Basin Plan, it is amended.
- Contemporary water resource policy – plans are adjusted to ensure they align with current policy to improve how we reach water resource management objectives across the state. Changes can be purely administrative or more substantial.
- Improvements to our data and knowledge (such as climatic, environmental or extraction information) and updated technologies.

When we make changes, these aim to address the requirements of the above drivers. The provisions must also be able to be carried out and legally accurate. Finally, the changes seek

to modernise and simplify the plans to make them easier to understand and more able to meet water sharing plan objectives.

3 Updates to our planning approach for replacing plans

3.1 Building on the macro planning approach

3.1.1 Approach to developing the first round of plans

Before 2010, water sharing plans were developed for individual water sources. For example, Kangaroo River and Tarcutta Creek each had their own plan. These water sources were often a single catchment or aquifer within a larger river catchment or groundwater system. Water sharing rules within these plans were based on environmental and economic assessments for these individual water sources.

Similarly, for regulated rivers, particularly in inland NSW, data, assessment methods and rules were often unique to each catchment. The first plans developed were guided by a series of water sharing advisory notes to assist the then water management committees to recommend draft rules to the minister. The individual approach to developing each plan through recommendations from water management committees meant that the approach to water sharing wasn't always consistent across NSW. This approach was also very resource intensive and took a significant amount of time to develop each individual plan.

As water sharing plans had to be developed for all surface and groundwater water sources across NSW, we replaced this approach with the macro planning approach.

3.1.2 The macro planning approach

In 2010, the NSW Government developed and applied a standard 'macro' planning approach⁴ to developing water sharing rules for unregulated rivers and groundwater. This approach was to complete a single assessment to determine access and trade rules for multiple water sources.

While developing this approach, the NSW Government also developed a suite of policies to guide more consistent approach to the sharing of surface water and groundwater across the state.

The macro planning approach assessed the risks to, and values of, water sources to determine the most suitable draft access and trade rules. For groundwater, the approach also helped determine long-term volumes of water for extraction and the environment. The macro planning approach risk assessment considered environmental, economic and social factors. The risk

⁴ Refer to NSW Office of Water, 2011, *Macro water sharing plans – the approach for unregulated rivers: A report to assist community consultation*, NSW Government, for a full description of the approach as it applies to unregulated rivers and groundwater.

assessment used state-wide data sets to estimate the values of each factor for all water sources.

For unregulated rivers, we analysed the data to provide indicative ratings of:

- in-stream ecological value
- hydrologic stress (the amount of water extracted relative to low flow)
- risk that extraction of water poses to water source ecosystems
- economic dependence of an area on water extraction.

This approach determined indicative access rules⁵ and trade rules for each of the water sources.

For groundwater, we assessed the volume of recharge to a groundwater system and the risks to the groundwater system from extraction. We used these results to set long-term limits on take of groundwater and the amount of water reserved for the environment.

We also set the rules for groundwater systems based on their level of connectivity with surface water systems. Where surface water and groundwater were highly connected, we considered using surface water access rules for groundwater access. To determine distance rules for new groundwater works, our assessment also looked at protecting:

- high-priority groundwater-dependent ecosystems (GDEs)
- Aboriginal groundwater-dependent culturally significant sites
- existing groundwater users.

Local departmental staff responsible for fisheries, agriculture and the environment who were familiar with the water sources then reviewed indicative ratings and rules in an interagency working group. We used their findings to help develop draft risk ratings and water sharing rules, then publicly exhibited these and used them for targeted consultation. Where necessary, we amended the rules to address matters raised during public exhibition before ministers gave concurrence to and approved the plans as an enforceable statutory plan.

3.1.3 New planning approach

The macro planning approach had the advantages of being transparent, standardised and uniformly applied across hundreds of water sources. However, there were limits to the precision of spatial data, estimates of the risk of extraction and the range of risks that we assessed.

As a result, the department developed a new risk assessment approach. Now when developing replacement water sharing plans, we assess risks at a water source level for each plan. We also review the earlier macro planning approach results for the plan and update data to assist in making decisions for the replacement plan.

⁵ Including surface water cease-to-take and commence-to-take rules.

The 'Updated methods in response to new information' section of this guide further discusses the new risk assessment approach.

3.2 Principles for water sharing plan replacement

Under Section 43A of the WM Act, the Commission's review of plans considers 'the extent to which the water sharing plan provisions have materially contributed to the achievement of, or failure to achieve, environmental, social and economic outcomes and whether those changes to the provisions are warranted'.

The department contributes to the Commission's review process and considers the recommendations of the review report.

If the Commission recommends the replacement of a plan, the department considers the recommendations, completes a complementary departmental review and updates the current plan content. Often, the departmental review takes place before or at the same time as the Commission's review.

These steps are to ensure that the department addresses the requirements for replacing a plan. Any replacement must consider the original requirements for water sharing plan provisions under Section 20 of the WM Act:

- a. the establishment of environmental water rules for the area or water source
- b. the identification of requirements for water within the area, or from the water source, to satisfy BLRs
- c. the identification of requirements for water for extraction under access licences
- d. the establishment of access licence dealing rules for the area or water source
- e. the establishment of a bulk access regime for the extraction of water under access licences, having regard to the rules referred to in paragraphs a. and d. and the requirements referred to in paragraphs b. and c.

In undertaking any plan replacement consideration must be given to the water sharing management principles. Section 9 of the WM Act requires everyone exercising functions under the Act to:

- take all reasonable steps to promote the water management principles and
- give priority to the water management principles relating to water sharing in the order they are set out under s5(3) of the Act.

The water sharing management principles under s5(3) of the Act are (in their order of priority):

- a. Sharing water from a water source must protect the water source and its dependent ecosystems.
- b. Sharing water from a water source must protect basic landholder rights.
- c. Sharing or extraction of water under any other right must not prejudice the principles set out in points a. and b.

Additionally, key principles of the department’s complementary review include:

- The review will seek to improve the efficiency and effectiveness of water sharing arrangements by targeting areas where new information shows the rules:
 - could be improved
 - are no longer appropriate
 - have had unintended impacts
 - have identified implementation difficulties.
- The review will use a collaborative approach to ensure it considers the views of all stakeholders when reassessing water sharing arrangements.
- Changes will seek to ensure that environmental outcomes of the plan are maintained or enhanced.
- Changes that affect water users will be minimised where possible.
- Changes to water sharing arrangements in water sources in the Murray–Darling Basin will meet the requirements set out in the *Basin Plan 2012*.

We use the findings of the review to develop the replacement plan.

3.3 Scope for water sharing plan replacement

The Commission holds the statutory responsibility for the formal review of water sharing plans. However, the department’s review has a deliberately broad scope to investigate issues and determine whether the plan has met required outcomes or whether changes are necessary.

3.3.1 Issues in scope

To determine which issues are in scope, we use the Commission’s review and other sources, including stakeholder feedback, to prepare a list of known water sharing plan issues. The department assesses this list, working with its subject matter experts as necessary, to decide whether the issues are within the scope of the replacement process.

The scope of the review will consider but is not limited to the factors Table 3 describes.

Table 3. In-scope considerations and sources for information

In-scope considerations	Potential information sources
New information that shows the current water sharing arrangements are no longer appropriate or could be improved	Section 44 audits; Section 43A reviews; monitoring, evaluation and reporting; plan suspensions; plan amendment register; stakeholder feedback, issues register
New information that informs update of plan provisions	Information relating to new infrastructure, socio-economic data, water user behaviour, risk assessments, threatened species information, GDEs,

	BLRs, water entitlements, Aboriginal water-dependent values and uses
Changes in policy or other legislation	Critical infrastructure legislation, departmental policies, <i>Water Act 2007</i> and <i>Basin Plan 2012</i> requirements
Water sharing arrangements that have had unintended impacts or have not achieved intended outcomes	Section 43A reviews, plan suspension, plan amendment register, stakeholder feedback, issues register
Implementation issues	Section 44 audit, Section 43A reviews, plan suspension, plan amendment register, stakeholder feedback, issues register
Studies or amendments specified in the water sharing plan	Implementation program, individual study reports, amendment register
Amendments required to carry out regional water strategies or metropolitan water strategies	Strategy documentation

3.3.2 Out of scope

The department has also developed criteria for what is out of scope to simplify setting the scope of the review. These criteria can help refine the list of issues considered in scope later in the planning process, as we examine issues and their effects become clearer.

The department uses the criteria in Table 4 to assess whether an issue is out of scope. We may add other criteria when relevant.

Table 4. Assessment criteria for identifying whether an issue is out of scope

Assessment criteria	Comment/Example
Does the issue relate to water charges, costs, infrastructure proposals, operational activities or a licensing matter?	Issues that a water sharing plan cannot address
Is another program or process addressing the issue, or is it the responsibility of another department?	Improving alternative water supplies for specific towns, drainage management
Does the issue require time and resources beyond the time frame to review the water sharing plan?	A study on the effects of climate change in a particular valley
Is the issue consistent with the current legislative and policy framework?	Allowing the building of harvestable rights dams on third-order streams
Does the issue contradict a <i>Basin Plan 2012</i> requirement (inland water sharing plans only)?	Restriction of trade that discriminates against one category of licence

3.4 Project governance

The department develops replacement plans based on advice from several departmental subject matter experts, including those in planning, policy, modelling and science. We also collaborate on the plans with other agencies in interagency working groups. In addition to the

department, the agencies involved in developing replacement plans include but are not limited to:

- Department of Primary Industries – Fisheries
- Department of Primary Industries – Agriculture
- Department of Climate Change Energy, the Environment and Water – Biodiversity, Conservation and Science
- WaterNSW
- Natural Resources Access Regulator.

Once we develop and publicly exhibit a plan, it must be endorsed and approved to begin (Figure 1).

Figure 1. Water sharing plan governance



Minister for Water seeks concurrence from the Minister for the Environment

3.5 Policy updates and legislative changes

3.5.1 Consolidating water sharing plans

Section 45A of the WM Act allows for the consolidation of two or more management plans. We look for opportunities to consolidate water sharing plans where it is practical.

The benefits of consolidation can include:

- greater consistency of approach to water sharing between water sources

- alignment of the boundaries of water sharing plans with regional water strategies; if possible, this would remove potential legal or planning impediments to developing and adopting demand and supply measures in regional water strategies
- alignment of NSW water planning boundaries with Basin Plan planning boundaries
- reduced departmental resource demands and duplication of tasks.

The department acknowledges that consolidating plans may raise stakeholder concerns. Some of these may be around:

- increased town water supply transfers between plan areas. However, the high priority of town water supply, particularly during drought, means that water transfers between plan areas for town water supply would likely be developed anyway. Consolidating plans better establishes the legal arrangements for inter-basin transfers
- potential for increased trade. However, trade may occur only between areas that are hydrologically connected, and water sources of a plan area are usually hydrologically disconnected from those water sources of an adjacent plan area. Trades between water sources of consolidated plans would be prohibited unless they are hydrologically connected
- potential for inequity when plans merge. Each plan had its own macro planning approach risk assessment, which rated each water source against others within the plan area. It is likely that if the water sharing plan areas combine, there will be disparities in the risk and value ratings, as well as access and trade rules for water sources of both plan areas.

For example, a water source with the highest ecological value in the individual water sharing plan would receive a high in-stream value rating. However, once the water sharing plans combine, this water source might have only a moderate in-stream value rating compared with water sources within the new, larger water sharing plan area. This might mean that water sources with similar characteristics in different water sharing plans have different access and trade rules once the plans merged. Using the new risk assessment completed on the water resources of the new plan area as a whole would likely mitigate this in part.

The department assesses whether plans should be consolidated on a case-by-case basis. We also consider the recommendations of the Commission when deciding whether to consolidate plans.

3.5.2 Considering other forms of take in replacement water sharing plans

Previous plans inconsistently consider water take by harvestable rights or take via interception by plantation forestry in the long-term average annual extraction limit (LTAAEL). Similarly, there was no consistent approach for considering other forms of take in the 'Requirements for water' section of the plans.

To ensure the replacement plans are consistent, we have taken an overarching approach to considering these forms of take, which this guide details below.

Harvestable rights

Harvestable rights allow landholders (owners or occupiers of land) to capture and store a proportion of the rainfall runoff from their landholding in one or more harvestable rights dams without a water access licence or approval. In some parts of NSW, water take under harvestable rights⁶ is a significant form of take.

In May 2022 the limit for uptake of harvestable rights water in coastal catchments was raised from 10% to 30%. As of 27 September 2023, the harvestable rights limit for coastal NSW has been returned to the previous limit of 10%⁷, to allow sustainable levels of extraction to be determined.

Landholders in coastal-draining catchments and central inland-draining catchments of NSW are able to capture up to 10% of the average regional rainwater runoff from their property in harvestable right dams built on non-permanent minor streams, hillsides and gullies that can be used for any purpose. In the Western Division of NSW, 100% of average rainfall run-off can be captured for any purpose.

A volumetric estimate of this form of take will be specified in replacement coastal unregulated and alluvial plans in the relevant 'Requirements for water' section of the plan.

As part of amending inland water sharing plans to meet the requirements of water resource plans, take under harvestable rights was considered in the LTAAEL. Further, replacement unregulated coastal plans will also include harvestable rights within the LTAAEL, set at a volumetric estimate of the right that existed at commencement of the first water sharing plan.

Inland replacement plans will include a description of this take in the LTAAEL and later move to a volumetric estimate.

Plantation forestry

Rainfall run-off and aquifer recharge are reduced in areas of plantation forestry compared with other land-use types, such as broad acre agriculture.⁸

Under the National Water Initiative, NSW is committed to principles to manage the interception of water by plantation forestry. The specific commitments vary based on whether water resources in a catchment are fully allocated or not. A NSW Commercial Plantations Policy is in development and is expected to address potential forestry impacts on ground and surface waters. Until the policy is finalised, NSW has committed to meeting the requirements of the National Water Initiative within its existing management framework.

⁶ Harvestable rights areas in NSW can be found on the department's [Harvestable rights](#) website.

⁷ Further information regarding the changes to policy in 2022 and 2023 can be found on the department's website frequently asked questions website [Frequently asked questions | Water \(nsw.gov.au\)](#)

⁸ Prosser, I and Walker, P 2009, *A review of plantations as a water intercepting land use in South Australia*, CSIRO.

The commonwealth *Basin Plan 2012* also requires NSW to have regard to risk of growth in commercial plantations which have the potential to have significant impact on the water resources of NSW's Murray Darling Basin.

NSW assessed the risks in 2010 and 2020 as part of the development of water resource plans and concluded that plantations do not pose a significant threat to water availability in NSW.

The plantation industry has not grown significantly since 2009.⁹ We do not currently consider interception of water by plantation forestry to be significant water take in NSW. NSW also does not currently consider it a form of water take that should be licensed. As such, it is not specified in the 'Requirements for water' section of the plans or the LTAAEL. NSW monitors changes for significant expansion over and above 2009 levels in the plantation industry. If significant growth in the industry or its water use occurs, water take by plantation forestry will form part of the LTAAEL.

If monitoring of net take by commercial plantations shows that there is an increase in the quantity of water being intercepted or, meeting environmental watering requirements is compromised, NSW may consider access restrictions through use of discretionary conditions or temporary water restrictions under section 324 of the WM Act.

Replacement plans include an amendment provision so that we may make changes to the plans if NSW finalises a new policy on accounting or managing interception by plantations during the plan period.

3.5.3 Policies for other water management frameworks

A range of water management frameworks manage water in NSW. These include but are not limited to:

- the NSW State Water Strategy
- Regional Water Strategies
- the Marine Estate Management Strategy
- urban water management plans and strategies
- water resource plans
- long-term (environmental) water plans.
- New emerging Cultural water plans

The 'Policies for other water management frameworks' section describes these frameworks and their relationship to water sharing plans in more detail.

⁹ Australian Bureau of Agricultural and Resource Economics and Sciences 2020, 'Plantation and log supply', accessed from www.agriculture.gov.au/abares/research-topics/forests/forest-economics/plantation-and-log-supply#australian-plantation-statistics-2020-update

Other water management frameworks may create policies. We will review these policies and consider their effects when replacing water sharing plans.

3.5.4 Extraction limits

Inland systems

All our water sharing plans in the Murray Darling Basin (MDB) have long-term sustainable diversion limits (SDLs) established under the Commonwealth *Water Act 2007* and meet the requirements of the *Basin Plan 2012*. They also have extraction limits established under the provision of our WM Act, which are described in the water sharing plans as long term average annual extraction limits (LTAAELs).

Both the *Basin Plan 2012* and the Murray–Darling Basin Authority (MDBA) were established under the *Water Act 2007*. The MDBA determined that the existing level of water extraction for the basin in 2009 was 13,623 GL. The MDBA also determined that the long-term sustainable diversion limit (SDL) was approximately 10,873 GL per year, or 2,750 GL lower than the 2009 baseline diversion level.

The SDL aims to ensure there is sufficient water to maintain the environmental health of the Murray–Darling Basin by limiting the amount of water that users can extract from the Basin and considering the social and economic impacts of water recovery. SDLs are specified as a long-term average annual water use at a SDL unit level and on a basin-wide scale. Compliance with the SDLs is assessed in accordance with the requirements under the Commonwealth *Water Act 2007* and the Basin Plan as set out for each SDL unit in the relevant water resource plan.

For most groundwater water sharing plans, the SDL is equal to the LTAAEL. Where the LTAAEL was greater than the SDL and the number of entitlements was less than the SDL, we amended the water sharing plan to reflect the SDL.

All our plans have a LTAAEL and we assess compliance with this limit according to the rules of the relevant water sharing plan. This involves calculating the average annual extraction each year over the previous five-year period. Non compliance occurs when this calculated average annual extraction exceeds the LTAAEL by either 5% or 10%, as set out in the water sharing plan.

Coastal systems

Coastal unregulated water sharing plans are not required to be compliant with the Basin Plan or the Commonwealth *Water Act 2007*. The WM Act establishes the setting of an extraction limit and is described in the plans as a LTAAEL. The recommendations from many of the Commissions reviews of coastal water sharing plans is to set a numerical and sustainable extraction limit for coastal areas.

Work is currently underway to determine what a sustainable extraction may look like in the coastal context and what an appropriate LTAAEL may be in the context of sustainable extraction for each water source. The ‘Method for setting LTAAELs’ section of this guide discusses this further.

3.5.5 NSW non-urban water metering framework

The NSW Government put a metering framework in place in December 2017 to measure and monitor non-urban water take in NSW. The government developed this framework in response to the independent investigation into NSW water management and compliance¹⁰ and the Murray–Darling Basin Water Compliance Review.¹¹

The metering framework aims to improve the standard and coverage of non-urban water meters in NSW.

The metering framework comprises the:

- NSW non-urban water metering policy
- metering-related provisions of the Water Management (General) Regulation 2018
- metering-related provisions of the WM Act.

Under the WM Act, a metering condition is imposed on water take. It requires metering equipment to be installed, used and properly maintained on some water supply works.

The *Water Management (General) Regulation 2018* sets out the requirements of all holders of approvals, licences and entitlements who are subject to the metering condition. It also prescribes which holders are exempt from the metering condition. The regulation also contains requirements for duly qualified persons, telemetry, record-keeping and reporting rules, and a process for faulty meters.

The department administers the metering framework under delegation from the minister. The policy and the metering-related provisions of the WM Act and the *Water Management (General) Regulation 2018* commenced on 1 December 2018. Some parts of the regulation relating to new and replacement meters, faulty meters and inactive works commenced on 1 April 2019. The remainder of the framework will roll out in stages from 1 December 2020 to 1 December 2024.

Under sections 17(c) and 100 of the WM Act, a water sharing plan sets conditions to which water licences and approvals are subject. For metering, the plans set out the requirements for water supply work approvals to have mandatory conditions for the installation, use and maintenance of compliant metering equipment. The plans also set out the requirement for the approval holder to notify the minister in the event of a condition breach. Visit the department's [non-urban metering webpage](#) for more information on the non-urban metering framework and your obligations to meter water extraction.

3.6 Links to other water management frameworks

¹⁰ Matthews, Ken 2017, *Independent investigation into NSW water management and compliance – final report*, www.industry.nsw.gov.au/___data/assets/pdf_file/0019/131905/Matthews-final-report-NSW-water-management-and-compliance.pdf

¹¹ Murray–Darling Basin Authority 2017, *The Murray–Darling Basin Water Compliance Review*, www.mdba.gov.au/sites/default/files/pubs/MDB-Compliance-Review-Final-Report.pdf

3.6.1 NSW Water Strategy

The NSW Government has developed a 20-year, state-wide NSW Water Strategy to improve resilience of the state's water resources over the coming decades. Implementation of the NSW Water Strategy will address key challenges and opportunities for water management and service delivery across the state and set the strategic direction for the NSW water sector over the long-term. The strategy will:

- guide water service delivery and resource management across NSW
- build on the progress made from previous reforms and set the direction to keep improving
- identify key challenges, opportunities, strategic priorities and actions for the whole of NSW
- clearly articulate the water resource management and service delivery framework and policy context for NSW, including how the Murray-Darling Basin Plan and state-wide, regional, metropolitan and local strategic water policy and planning frameworks work together.

The NSW Water Strategy and the regional and metropolitan water strategies do not replace statutory instruments (such as water sharing plans). They set the agenda for water management and service delivery into the future and are designed to contribute to water management outcomes aligned with the objects and principles of the WM Act, the NSW government's priorities and NSW's commitments under the Murray-Darling Basin Plan, the National Water Initiative, and other commitments such as the Great Artesian Basin Strategic Management Plan.

The NSW Water Strategy outlines seven priorities, and actions taken by the NSW Government in each priority area. Under these priorities, the strategy will improve water sharing plans by:

- enhancing modelling
- reviewing the regulation of domestic and stock landholder rights
- making sure non-urban water take is accurately measured
- working with Aboriginal people to maintain and preserve water-related cultural sites and landscapes
- investing in long-term and effective monitoring, evaluation, reporting and research
- working with communities to better understand and improve system connectivity
- reviewing water allocation and water sharing in response to new climate information improving the operation and transparency of water trade.

3.6.2 Groundwater Strategy

A NSW Groundwater Strategy has been developed as a key action under the NSW Water Strategy. The groundwater strategy describes groundwater resources across NSW and how they are currently managed. It also identifies key risks to the resources, management challenges and sets out key actions in response to the challenges. The [NSW Groundwater Strategy](#) can be viewed on the department's website.

3.6.3 Aboriginal Water Strategy

Priority 2 of the NSW Water Strategy is to:

‘recognise First Nations/Aboriginal People’s rights and values and increase access to and ownership of water for cultural and economic purposes’.

An action under this priority is to develop a state-wide Aboriginal Water Strategy in partnership with First Nations/Aboriginal People.

A dedicated Aboriginal Water Program has been established to develop the strategy and other projects which recognise the water rights and of Aboriginal people and improve water outcomes for Aboriginal communities, including setting up Regional Aboriginal Water Committees and developing cultural watering plans.

3.6.4 Regional water strategies

Regional water strategies aim to understand how much water a region will need to meet future demand, the challenges and choices involved in meeting those needs, and the actions we can take to manage risks to water availability. They have a 20 to 40 year planning horizon.

Using new climate data, each regional water strategy will develop a portfolio of options that meets one or more of the objectives of the regional water strategies. Once each strategy is finalised, each option will be further developed. Depending on the scale and type, some options will need to be approved through extensive planning approval pathways.

The options within regional water strategies will work within, or recommend changes to, the policies and plans that guide how water resources are managed in NSW. Despite this, water sharing plans continue to be the legal instruments for managing water resources in the state.

It is possible that the new modelling data gathered through regional water strategies and the options developed will inform changes to water sharing plans. More specifically, it is possible that changes to water sharing plans will be informed by the:

- new modelling data gathered through regional water strategies, in terms of climate variability and climate change risks
- outcomes of community engagement that are providing a better understanding of future water requirements.

We will consider other work for the regional water strategies, including updates to socio-economic data, while developing replacement water sharing plans.

When strategy options may trigger amendments to a water sharing plan in that specific region, the timing of these amendments would depend on a range of factors, including the:

- further development and implementation of regional water strategies
- rules for amending the water sharing plan
- timing for reviewing and remaking a water sharing plan
- requirements under the planning approvals.

For water sharing plans within the Murray–Darling Basin, there are further concerns. If changes are required to water sharing arrangements accredited as part of the water resource plan, the MDBA will need to reassess these changes to ensure they meet *Basin Plan 2012* requirements.

3.6.5 Water resource plans

NSW is responsible for 20 water resource plans as part of implementing the Basin Plan across surface and groundwater. The water resource plans ensure the implementation of sustainable diversion limits for our water resources. Water resource plans set out arrangements for sharing water for consumptive use, establish rules to meet environmental and water quality objectives, and account for potential and emerging risks to water resources.

Water resource plans are assessed and accredited by Australian Government as meeting the requirements of the Basin Plan. Water sharing plans made under NSW legislation cover the entire NSW portion of the Murray–Darling Basin. The water sharing plans remain the primary legal framework for how water is accessed and shared.

The water resource plans list the relevant water sharing plans for the area in their Schedule A. As part of the water resource plan development process, a small number of key provisions of water sharing plans were amended to meet the requirements of the Basin Plan.

3.6.6 Long-term (environmental) water plans

The department's then Environment, Energy and Science division (now Biodiversity, Science and Conservation) developed long-term environmental water plans to meet Basin Plan requirements. These plans draw on local, traditional and scientific knowledge to guide the management of water for the environment over the long term.

The department developed nine plans covering the NSW Murray–Darling Basin catchments and set objectives for 5, 10 and 20-year time frames. The plans set objectives, targets and watering requirements for key plants, waterbirds, fish and system functions.

Water sharing plans include provisions for the environment through the LTAAEL, access rules, trading rules and environmental water holdings.

3.6.7 Marine Estate Management Strategy

The Marine Estate Management Strategy is a framework for protecting the marine estate. It responds to priority threats to water quality, habitats and biodiversity of NSW's coastal waters and estuaries. The strategy also aims to maximise community benefit derived from the marine estate.

Initiatives of the strategy are:

- improving water quality and reducing litter
- delivering healthy coastal habitats with sustainable use and development
- planning for climate change

- protecting the Aboriginal cultural values of the marine estate
- reducing impacts on threatened and protected species
- ensuring sustainable fishing and aquaculture
- enabling safe and sustainable boating
- enhancing social, cultural and economic benefits
- delivering effective governance.

Coastal water sharing plan objectives relate to several initiatives that the strategy outlines. By protecting water quality and native fish species and managing connected waters, including estuaries, coastal water sharing plans are contributing to the initiatives of the strategy.

The NSW Department of Primary Industries – Fisheries implements the strategy. Our department collaborates with the Department of Primary Industries – Fisheries on the water sharing plan interagency working groups. This creates more opportunities to ensure coastal water sharing plans are supporting the objectives and initiatives of the strategy.

3.6.8 Urban water management

Water sharing plans set share components of licences for town water supply. Some plans also set system operation rules, including rules for releases from town water supply infrastructure, such as dams or weirs.

The water sharing plans for the Greater Sydney and Newcastle metropolitan regions are uniquely complex. Metropolitan water utilities in the Hunter and the Greater Sydney metropolitan area implement water plans for drought security and future water supply. These are the:

- Lower Hunter Water Security Plan – this plan was released in April 2022 and provides options for drought security and includes actions to supply, save and substitute water.
- Greater Sydney Water Strategy – this plan was released in 2022 charts a direction for delivering sustainable and resilient water services to Greater Sydney for the next 20 to 40 years, servicing a growing Greater Sydney and safeguarding our city even in times of prolonged drought and extreme weather events. The strategy sets out priorities and actions for the delivery of water, wastewater, recycled water and stormwater services into the future to support a sustainable, liveable and productive Greater Sydney.

If a water utility needs to augment their town water supply, the corresponding water sharing plan may need to be amended to account for extra share components, new infrastructure, or both.

4 Updated methods in response to new information

This section summarises our processes for developing replacement plans based on the availability of new information.

4.1 Natural Resources Commission recommendations

The Commission must review plans approaching expiry and report to the Minister for Water, the plan's success or failure in achieving the objectives and whether changes are necessary.

If a plan needs replacing, the Commission will provide recommendations to improve the plan in the review report. These recommendations help guide the department in developing the replacement plan. The department may adopt the recommendations but is not required to do so. The department will weigh up the costs and benefits of the recommendations when deciding whether to adopt a recommendation.

The Commission calls for public submissions during the water sharing plan review process through its [website](#) and then publishes its final review documents on this same [website](#).

4.2 Monitoring, evaluation and reporting framework

The NSW Water Management Monitoring, Evaluation and Reporting Framework coordinates activities conducted by multiple agencies in relation to NSW water management. Monitoring, evaluation and reporting (MER) activities also contribute to a broader understanding of water management, and river and wetland health over time.

4.2.1 Objectives, strategies and performance indicators

The objectives and strategies of plans provide a clear description of what the plan is aiming to achieve, a roadmap to achieving them, and a framework for the evaluation of plan success or effectiveness. To enable meaningful evaluations, the development of plan objectives should show clear links between what a plan can control via water management strategies and the desired economic, social/cultural or environmental outcomes for the plan area.

Under Section 35 of the *NSW Water Management Act 2000* (WM Act) a water sharing plan must include a vision, objectives, strategies and performance indicators in order to describe its intent, provide direction to its rules and measure its success.

The plans objectives, strategies and performance indicators are shaped by the MER framework to ensure sound policy, planning and regulatory decision-making during future evaluation of the plans.

4.2.2 Risk-based approach

The MER framework uses a risk-based approach. As part of the plan replacement process, we conduct a risk assessment.

Risk-based management assists water managers to prioritise and direct time and effort to monitor, mitigate, or respond to the factors that pose the highest overall risks. It ensures that management is targeted, efficient and effective, and when used adaptively, is an excellent tool for determining where future management and monitoring effort is required. We have been implementing a risk-based water planning process in unregulated rivers since 2004, in the form of risk assessments.

The risk assessment provides risk-based information as part of our adaptive management approach to water sharing plans.

Risk assessments for inland water sharing plans

The department, in line with the requirements of the *Basin Plan 2012*, developed surface water and groundwater risk assessments to guide the development of water resource plans. The risk assessments use cause, threat and impact pathways to consider a variety of risks to the condition and continued availability of surface water and groundwater resources. Risk outcomes were based on assessing the likelihood of a cause occurring and the consequences of impacts. We adopted the following definitions for risk assessments in the Murray–Darling Basin:

- likelihood – the probability that a cause will result in a threat; it is not a sign of the size of the threat but rather conveys the probability that the threat will be significant
- consequence – the loss of value for an impacted receptor.

We assessed the risk outcomes with current strategies and water sharing rules as per the WM Act and the relevant water sharing plans in place. The risk assessments outlined the management actions and mechanisms available to address risks.

As part of the inland risk assessments, we review all medium and high risks to water sources to determine whether existing strategies adequately address them or if modifications or new strategies are necessary. If the existing strategies adequately address a risk, it is considered tolerable.

A risk may be intolerable if it cannot be mitigated due to a range of constraints, including infrastructure, third-party economic or social impacts, or sustainable diversion limits. We will further develop this tolerability assessment as new information becomes available.

Risk assessments for coastal water sharing plans

We used a similar risk assessment process to the one for inland water resource plans in replacing unregulated, regulated and alluvial coastal water sharing plans. This new approach

gives reach-scale outcomes based on fine-scale high-ecological-value-aquatic-ecosystems (HEVAE)¹² data and reach-scale hydrologic information.

The new approach allows for more precise and nuanced interpretation than the previous macro planning approach. We also used additional risk categories, such as risks associated with climate change and risks to the environment and water users from poor water quality. 66 provides an overview of the new risk assessment approach.

The risk assessments review available work on estuaries within the plan boundaries. The new approach provides improved evidence for decision-making, including:

- ratings of the ecological value at the reach scale
- ratings of the likelihood of insufficient water for freshwater ecosystems for different parts of the flow regime
- ratings of hydrologic risk for different parts of the flow regime
- analysis of a wider range of threats to flow alteration – that is, licenced extraction, BLRs, interception and climate change.

The coastal plan risk assessments do not identify which risks are tolerable and which are not. We assess tolerability through the planning assessment for coastal areas using an approach like that for inland risk assessments.

The risk assessments categorise the ecological value (consequence) and the likelihood of extraction impacting the ecological value and come up with a risk rating.

4.2.3 Rule changes using the new risk assessment

We use the current risk assessment to triage proposed rules for unregulated surface water coastal and inland replacement plans. This triage process recognises the improvements in assessing ecological and hydrological risks and incorporates this information when developing rules.

This approach does not account for social and economic considerations to the same level as environmental. However:

- the WM Act requires us to prioritise the environment, so this is the initial basis for assessment
- stakeholders have an opportunity to have their say through the Commission review process and through targeted and public consultation.

We use three parameters from the risk assessment in decision-making for rule changes or rule development for replacement plans:

¹² Healey M, Raine A, Lewis A, Hossain B, Hancock F, Sayers J, Foster J and Dabovic J. 2018, *Applying the High Ecological Value Aquatic Ecosystem (HEVAE) Framework for Riverine Ecosystems*, NSW Department of Industry.

- consequence – ecological value
- likelihood – likelihood of extraction impacting ecological value
- risk – combination of consequence and likelihood.

We created flowcharts that summarise these three parameters as tools for decision-making. 71 provides these flowcharts and focuses on the risks to freshwater ecosystems and water quantity.

The replacement water sharing plan working group reviews the results of the planning assessment using the flowchart decision-making tool. Internal and interagency groups also review the results. Additional considerations for determining rule changes include:

- local knowledge of the water source and water management issues
- further investigation of the risk and causes
- better understanding of actual usage and impacts
- the ability to manage the impacts of extraction through water sharing arrangements.

We incorporate these into decisions about new rules and provisions.

4.3 Water management area boundaries

Water management boundaries (management zones and water sources) in the plans may change when developing the replacement plan. Boundaries may change because of new information, such as the installation of new monitoring gauges or new trading provisions.

As part of replacing the plans, we will review management zones to assess whether they are appropriate. Where a plan has unnecessary management zones, we may remove these. On the other hand, if an unregulated water source is large and the existing flow reference point is insufficient for the entire water source, we may divide it into management zones. Management zones may also change to implement or dissolve trade restrictions.

In coastal water sharing plans, surface water plan limits typically align with the ‘mangrove limit’ to include any tidal pools within the water sharing plan. However, where this is impractical – for example, due to the absence of mangroves or high salinity – surface water plan limits can be set to a locally relevant point for a given watercourse.

We will also review the boundaries of groundwater water sources and ensure we have considered any new information. Groundwater plan limits will extend to the coast and could include water in alluvium, coastal sands or underlying hard rock.

4.4 Managing coastal floodplain alluvial groundwater sources

Coastal floodplain alluvial groundwater is shallow groundwater that is downstream of the tidal limit of a coastal river. During the first round of water sharing plans, the aim was to manage

coastal floodplain alluvial groundwater under a separate plan that managed all coastal floodplain alluvial groundwater. Since then, the department has chosen to include floodplain alluvial groundwater within the local surface water and connected alluvial sharing plan.

Coastal floodplain alluvial groundwater is treated as its own water source in a plan. We use the groundwater macro planning approach risk and value assessment, as it is a new water source in replacement plans.¹³ The assessment considers risks of groundwater extraction to high-priority GDEs, to socio-economic considerations and to the groundwater source itself.

The assessment also identifies measures to mitigate those risks, such as water sharing rules. The risk assessment sets volumes of water for the environment and extractive use, including planned environmental water and the LTAAEL. For the method of calculating the LTAAEL in coastal floodplain alluvial water sources, see 'Method for setting LTAAELs'.

4.5 Basic Landholder Rights (BLR)

4.5.1 Domestic and stock rights

Since the commencement of the development of the first water sharing plans prior to 2003, numerous methods have been followed to estimate water requirements for domestic and stock basic landholder rights.

These methods were superseded by a standard NSW approach to support the development of surface and groundwater macro sharing plans in 2010. In 2020 the same method used in the development of macro water sharing plans was adopted for estimating the water requirements of domestic and stock basic landholder rights.

The 2020 estimates may differ from estimates in the current water sharing plans due to changes in land use, population density and the availability of more accurate spatial data.

This approach is subject to improvements in data, new information, new studies and method refinement. 76 provides a detailed description of the method. We may modify this approach for plans in the metropolitan areas due to their complexity and limited use of water for stock.

4.5.2 Harvestable rights

Harvestable rights allow landholders to collect rainfall runoff to a volume which depends on their location:

- in coastal-draining and central inland-draining catchments harvestable rights areas – 10 per cent of the average annual rainfall runoff may be captured and used for any purpose.
- in the Western harvestable rights area – all rainfall runoff (100 per cent) may be captured and used for any purpose.

¹³ Refer to NSW Office of Water, 2011, *Macro water sharing plans – the approach for groundwater: A report to assist community consultation*, NSW Government, for the macro approach for groundwater.

The harvestable right aims to satisfy essential farm needs, such as stock and household water. It can also be used for any purpose, including commercial irrigation¹⁴.

Replacement unregulated coastal plans will include a numerical estimate of harvestable rights which exists at the commencement of the replacement plan. Inland replacement plans will include a descriptive estimate of harvestable rights take until a volume is estimated.

In May 2022 the limit for uptake of harvestable rights water in coastal catchments was raised from 10% to 30%. As of 27 September 2023, the harvestable rights limit for coastal NSW has been returned to the previous limit of 10%, to allow sustainable levels of extraction to be determined prior to any consideration of increases in harvestable rights.

Due to the small number of instances where landholders registered their intent to increase harvestable rights uptake during this time, the department does not expect any significant changes to rules in plans as a result of an increased uptake of harvestable rights water. For more information on the specific changes to harvestable rights visit the department's [frequently asked questions](#) webpage or for general information, the [harvestable rights](#) webpage.

4.5.3 Native title rights

If native title has been determined under the *Commonwealth Native Title Act 1993*, and the native title determination applies to land and water, you can take and use water for the purposes specified in the native title determination without a water licence, water supply work approval (unless the work is a dam or bore), or water use approval. This is called your *native title right*.

If you have a native title right, you can use the water you take for purposes specified in the native title determination, including but not limited to:

- manufacturing traditional artefacts
- hunting and fishing
- recreational, cultural and ceremonial purposes.

The water sharing plans are structured so that Native Title Rights can be accessed as soon as a determination is made. The relevant plans will then be updated to include the determination at the next opportunity.

4.6 Licensed water requirements

¹⁴ To read more about harvestable rights, visit <https://water.dpie.nsw.gov.au/licensing-and-trade/basic-landholder-rights/harvestable-rights>

The 'Requirements for water' section of water sharing plans sets the amount of water licensed for extraction in each water source. Licensed entitlement¹⁵ may have changed throughout the 10-year term of the last plan, meaning this section of a water sharing plan requires updating.

Licensed water requirements are updated using the WaterNSW Water Licensing System. A search of the area that the water sharing plan covers identifies licences located in water sources of the plan. The licences are grouped into their licence category, which includes (but is not limited to):

- domestic and stock access licences
- local water utility access licences
- major utility access licences
- aquifer access licences
- aquifer (high security) access licences (groundwater plans only)
- aquifer (general security) access licences (groundwater plans only)
- unregulated river access licences (surface water plans only).

Specific-purpose access licences are also reviewed to identify any changes to entitlement. The replacement plan includes updated values for share components.

4.7 Water Act 1912 licences

In NSW, water take and its use are managed through a licensing framework under the WM Act. Previously, licences were managed under the Water Act 1912. Most licences were converted from the Water Act 1912 to the WM Act, but some licences are not yet converted.

When a replacement water sharing plan begins, if a Water Act 1912 licence in the water sharing plan area authorised:

- the taking of an unspecified volume of water from a water source, then the Water Act 1912 licence is not converted
- the construction and use of a work for drainage, then the Water Act 1912 licence is not converted in relation to the drainage work
- an aquifer interference activity, then the Water Act 1912 licence is not converted in relation to the aquifer interference activity
- the taking of water, or a work or activity that does not require a water access licence or approval under the WM Act, then the Water Act 1912 licence is not converted and no longer has effect.

¹⁵ As expressed in share components.

The department completes licence conversions and also manages legislation relevant to licence conversions. WaterNSW provides customer services relating to licence conversions. Please visit the department's [licencing and trade](#) webpage for more information.

4.8 Method for setting LTAAELs

The department is currently reviewing the method of defining LTAAELs for coastal WSPs. A common recommendation in coastal plan reviews by the Commission is that replacement coastal plans should have extraction limits that are volumetric, sustainable and include all diversions.

The National Water Initiative also states that governments must ensure that water is allocated and used to achieve socially and economically beneficial outcomes in an environmentally sustainable manner.

The department is currently assessing opportunities and challenges in understanding coastal suitable extractions and what appropriate LTAAELs look like under this framework for coastal unregulated and connected alluvial systems, while maintaining social, economic and cultural outcomes. Any methods identified under this program may then be adopted in the inland unregulated systems.

Coastal unregulated and alluvial plans replaced since 2022 set two numerical LTAAELs – standard and higher flow LTAAELs. This is to ensure that there is no increase in extractions from low flows where the majority of ecological impacts from extraction are felt. This approach allows additional extraction from higher flows to encourage extraction from higher flows rather than lower flows.

Currently, the LTAAEL of a surface water source is:

- for inland plans – the estimated average annual extraction of water from 1993 to 1999, plus estimates of native title rights and domestic and stock rights
- for coastal plans – the sum of all existing access licences at the start of the replacement plan, plus basic landholder rights (BLR) at the commencement of the first water sharing plan (including native title, domestic and stock and harvestable rights). Current plans may vary in regards to what components of BLR are included but as plans are replaced a consistent approach is applied. Where high-flow access licence conversions are allowed, there is also an allowance for an increase in the LTAAEL. The method for setting and calculating LTAAELs has been updated as replacement coastal plans are made. It will be replaced with two types of LTAAEL comprising:
 - the standard LTAAEL - applies to take from all flows by all licenced entitlements (except high flow only extraction licences) and by all basic landholder rights extraction (including harvestable rights). This is a fixed volume. Method for estimating basic landholder rights and harvestable rights take is included in 76 and 84 respectively,
 - the annual higher flow LTAAEL - applies to take that can only occur from high flows. This volume can vary as licences are converted to high flows or granted in high flows

such as specific purpose access licences (SPALs) for initial fill of dams or for Aboriginal Community Development Licences.

The LTAAEL of a groundwater source, by type, is:

- coastal upriver alluvial groundwater – due to the highly connected nature of upriver alluvial groundwater, the unregulated water source standard LTAAEL includes this type of groundwater.
- coastal floodplain alluvial groundwater – this alluvial groundwater is less connected than other forms of alluvial groundwater and is considered its own water source. As such, it has its own LTAAEL, which is calculated using the macro planning approach to groundwater risk assessment (see 75).
- fractured rock, porous rock, coastal sands, NSW North West and groundwater sources overlying the Great Artesian Basin – LTAAEL is calculated using the macro planning approach to groundwater risk assessment. The method used in replacement plans also uses spatial information. It differs slightly from the macro planning approach as it analyses risks to the environment to identify an upper limit of available rainfall recharge, and then assesses socio-economic risks using the available recharge (see 73).
- Murray–Darling Basin alluvial groundwater – LTAAELs are consistent with the sustainable diversion limits (SDL) set under the Basin Plan. The method of setting groundwater SDLs is explained in the Groundwater Report Cards from the Murray-Darling Basin Authority (2020) (PDF, 15.35MB).

4.9 Access rules

Plans set rules for the extraction of water. These are referred to as access rules, and they encompass a number of rules with differing names. Access rules and their meaning are described in Table 5.

Table 5. Access rules and their meanings

Access rule	Meaning
Cease to pump	The flow (measured as volume of water in megalitres per day) of a waterbody as measured at a specified gauge at which a licence holder must stop pumping or extracting water.
Commence to pump	The level of river flow when a licence holder can begin pumping after a cease to pump event.
Delayed pumping	A timeframe in which users must continue to cease pumping after a cease to pump event. For example, users must not start pumping 24 hours after flow has gone above the cease to pump value.
Limited pumping hours	Pumping is limited to a timeframe. For example, licence holders may only be able to pump between 7am and 7pm.

Flow classes	Classes represent river flows. These can be expressed as very low flow, A, B, C or D class – the very low flow class being the lowest flows, and D class being the highest flows. The very low flow class is associated with the cease to pump rule, for example, when river flows are within the very low flow class, cease to pump applies.
Individual daily extraction component (IDEC)	The volume of water that may be extracted daily by an individual licence holder in a particular flow class.
Total daily extraction limit (TDEL)	The volume of water that may be extracted daily under access licences in a particular flow class of a particular water source. Coastal plans include this rule to protect water sources. For example, a water source may have a TDEL of 2.3 ML/day. The amount taken out of the water source must not exceed 2.3 ML/day by all licence holders combined. TDELs may also be applied to local water utilities for a particular water source.

Access rules may change while developing the replacement surface water sharing plans due to several factors. These include:

- risk assessment findings
- community consultation
- water quality
- GDE identification
- socio-economic impacts of current rules
- additional gauge data
- hydrologic analysis
- new gauges.

If these factors are irrelevant in a particular plan, the access rule will remain the same in the plan.

As part of developing the replacement surface water plans, we calculate flow duration tables using observed flow data. The additional 10 years of data since the start of the plan can help identify any changes to the flow in the river for each access rule (that is, the top or bottom of the flow class).

Flow duration tables help us understand river flows. Flows are expressed as percentiles. For each access rule, we can identify what percentile flow it is. We do not change the access rules if there is a change to the flow percentile since the start of the first plan, but we may specify the percentile in the plan to document how flows in the river have changed.

For example, a plan has an access rule that states water users must cease to pump when flow in a river is less than or equal to 4 ML per day. The flow exceedance percentile for 4 ML per day will be identified using updated flow duration tables, and the percentile may be included

as a note in the plan or in the plan's background document. 84 includes the method for creating flow duration tables.

Adding flow classes to a water source means that specific-purpose access licences can be added to the plan. This includes access licences for unregulated river high flow and Aboriginal community development licences¹⁶ that can extract water only in high flows¹⁷ and so can be applied for only in water sources with gauges. Some replacement plans will introduce flow classes if a new telemetered gauge with at least 10 years of reliable data has been installed in a water source.

Some plans also use modelled data to inform what flows are like in a particular water source, particularly those with dams which make releases, where a gauge may not exist.

4.10 Reviewing trade opportunities

Trade opportunities in unregulated coastal and inland systems across NSW are limited or absent in some areas. This lack of flexibility inhibits development and makes it difficult to license existing historical take. It also locks in the status quo and does not allow water entitlements to be traded out of high-value or into highly productive areas.

Trading rules in most of the current plans were set using the macro planning approach for unregulated rivers and groundwater.¹⁸

The department recently investigated a revised approach for trade to be used in the development of replacement plans to encourage trading in unregulated rivers in NSW. This review evaluated the levels of entitlement that could be traded into a water source without unreasonably risking riverine ecology and adverse effects on water users. Risk in this case is a function of the level of consequence and the likelihood of that consequence occurring.

As a result of this review the department now looks at a range additional options to increase trade opportunities when replacing plans. The options will vary between plans and include examples such as analysis of interconnectedness of water sources for potential of trade between the water sources and allowing for access to water during high flows. There is more opportunity in these high flow periods as there are larger volumes of water at higher flows. Trading in at higher flows also avoids increasing risks to low flows. Limits on how much additional extraction can be traded in are determined by considering plan specific information.

Review of trading rules in coastal plans looks at changes in the ecological value of the water sources within the plan. Where values have reduced, trade may be opened up. Generally,

¹⁶ In coastal plans only.

¹⁷ In C class flows.

¹⁸ Refer to NSW Office of Water, 2011, *Macro water sharing plans — the approach for unregulated rivers: A report to assist community consultation*, NSW Government, and NSW Office of Water, 2011, *Macro water sharing plans — the approach for groundwater: A report to assist community consultation*, NSW Government.

upstream trade is not allowed unless there is a no net-gain rule in place (entitlement must be traded out before it can be traded in).

4.11 Floodplain management

The government is currently implementing the NSW Floodplain Harvesting Policy across six northern inland designated floodplains: Border Rivers valley, Gwydir valley, Upper Namoi valley, Lower Namoi valley, Macquarie valley and Barwon–Darling valley. This process issues floodplain harvesting access licences in regulated and unregulated river water sources. The relevant water sharing plans will include rules for these licences.

The take of water from floodplain harvesting activities is already built into the relevant water sharing plans for the northern inland valleys of NSW. The LTAAELs specified in these water sharing plans includes the take of water associated with floodplain harvesting activities within the plan.

As well as the LTAAEL, rules will apply to floodplain harvesting access licences once they are issued. We will amend the relevant water sharing plans to incorporate these rules, which relate to:

- share components for floodplain harvesting access licences, or the total entitlements per water source at a specified time
- compliance with extraction or diversion limits, or how any new growth in floodplain harvesting is managed
- available water determinations, including how allocation accounts will be credited each water year
- account management, or the limits on annual take and ability to carry over allocations
- accounting for the take of on-farm contaminated run-off when an access licence account has insufficient allocations
- trade, including permanent and temporary trade
- mandatory conditions for access licences and water supply works
- access arrangements
- amendment provisions to allow for adjustment of rules based on monitoring, evaluation and reporting.

We will monitor and evaluate to ensure floodplain harvesting access licences are achieving intended environmental and cultural outcomes.

4.12 Social and economic considerations

During the early phases of plan development, we collect information about the social, economic and cultural characteristics of a plan area. This information allows us to understand

the social, economic and cultural environment of a plan to assist in making decisions during plan development.

Once rule changes have been proposed, we consider the socio-economic, cultural and environmental impacts of the change, and this will inform the final decision about whether to adopt the change.

We identify the socio-economic, cultural and environmental effects of potential changes through interagency, community and stakeholder engagement. To understand the effects, we need the views of a broad range of representatives, including extractive water users, Aboriginal and environmental groups, and others.

The department engages with stakeholders using:

- interagency working groups
- public consultation
- targeted stakeholder consultation
- expert opinion
- other options where appropriate.

The aim is to understand the effects of different options, and how these effects will be distributed in the plan area and between plan areas. Where necessary, we may assess the options against the objectives in two stages: preliminary and detailed assessment.

The preliminary phase assesses the identified impacts and further defines the characteristics of the different options. This process helps determine whether the socio-economic, cultural or environmental effects are significant. Where this is the case, we complete a more detailed examination.

The preliminary assessment completes a qualitative comparison of the relative effects of the options, using current management rules as a baseline and input from consultation.

Where this qualitative assessment indicates effects may be significant, we complete a more detailed examination of socio-economic, cultural and environmental effects. This may involve a more detailed socio-economic assessment which measures productivity loss due to potential rule changes, so that we can make an informed decision about rule changes.

Productivity loss is measured as the impact of an additional day of not pumping on the daily production potential. If there are no days where licence holders are required to stop pumping, the production potential of the land is assumed to be 100%. More details on how productivity loss is measured to determine socio-economic impact of proposed rule changes, see 71.

4.13 Groundwater Dependant Ecosystems (GDEs)

Previous water sharing plans included a list of high-priority GDEs and distance rules related to water extraction near those GDEs. We identified these high-priority GDEs through a desktop study of known high-conservation-value GDEs.

These included:

- wetlands listed under the Ramsar Convention
- vegetation listed under state legislation
- karst conservation areas listed under state legislation.

We also identify GDEs by reviewing literature, known record databases and GIS records. GDEs we identified this way were not classified as high priority, and we left them out of the plan. Further study of identified GDEs was meant to be completed during the life of the plan.

We are now using a new method to identify GDEs for replacement plans. We now identify the location of likely groundwater-dependent vegetation using a range of data sources as indirect indicators. We also use published scientific knowledge to build a decision rule spatial model¹⁹, which is now a key tool to identify GDEs for water sharing plans. To assess the priority of GDEs, we determine an ecological value for the vegetation GDEs using the HEVAE framework.

Replacement plans will include a list of known, high priority GDEs and a map showing other high probability, high priority GDEs. Rules in the plans will specify distance conditions that will apply to water supply works approvals to protect known or confirmed high priority GDEs. Applications within restricted distances of high probability, high priority GDEs where groundwater dependence has not been confirmed will trigger an assessment of the groundwater dependence of the GDE and/or impact on the GDE as part of that application process.

4.14 Connectivity of water within and between systems

Water sharing plans aim to acknowledge the connectivity of water. Connectivity of water can include the relationship between:

- regulated and unregulated systems
- upriver freshwater, tidal pools and downstream estuaries
- surface water and groundwater.

Acknowledging these relationships can help create rules that address all parts of the system and their interconnectedness. This can help identify risks to areas outside the water sharing plan area, too, including risks to downstream users and the environment.

4.14.1 Connectivity in surface water plans

The updated environmental objectives in the surface water plans aim to protect connectivity:

¹⁹ Dabovic, J, Dobbs, L, Byrne, G, Raine, A 2019, 'A new approach to prioritising groundwater dependent vegetation communities to inform groundwater management in New South Wales', *Australian Journal of Botany*, Issue 67, pp 397–413.

- between and within water sources, including surface water and groundwater, and downstream fish passages
- between tidal pools, connected estuaries and connected upstream water sources.

The water sharing plan details strategies to protect connectivity. It also includes performance indicators to measure success of those strategies.

The new unregulated risk assessment approach considers connectivity of water within the plan area. It identifies risks at different flow levels of the water source, such as zero flows (no flow), low flows, fresh flows and high flows.

When flows in a river cease, the pools within the riverbed become disconnected. This restricts the movement of fish and affects a range of water quality processes. As such, pools are typically sensitive to the impacts of low and zero flow, and reduced flows can affect in-stream ecological values. Recognising risks around low and zero flow allows us to mitigate these risks.

Connectivity of surface water throughout a river is important for fish movement and good water quality. Identifying risks of zero and low flows creates an opportunity to implement mitigation measures to reduce risks of losing connectivity.

The coastal unregulated plan risk assessments also consider connectivity by identifying the risks of insufficient water for estuarine ecosystems at the end of the system and the impacts on marine parks.

4.14.2 Connectivity in groundwater plans

Groundwater water sharing plans acknowledge the connectivity of surface water and groundwater. Where there are high levels of connectivity between the groundwater source and surface water, the groundwater water sharing plan can place restrictions on access to that groundwater source.

The restrictions may include imposing a cease-to-pump rule on groundwater access directly related to the corresponding surface water sharing plan or in connected regulated systems linking the groundwater available water determination with that of the surface water system. Where connectivity may present a risk due to presence of saline or contaminated water sources near freshwater sources, specific licences can be granted which control the water table. These are known as salinity and water table management access licences.

4.15 New water delivery infrastructure

Currently NSW is progressing business cases for several large infrastructure projects such as dams, dam augmentations and weirs with the aim of providing greater water security for local water utilities. The department has been involved in discussions on management of water such as how the LTAAEL will be adhered to, considerations of planned environmental water infrastructure operational rules and other relevant watering plan rules.

4.16 New information

New studies and information can assist in our decision-making when developing replacement plans. New information can come from research advances since the last version of the plans.

The new risk assessment approach uses the latest information in its method, including threatened species data that is continually updated. New information often influences new processes. One example is the improved method for identifying GDEs, which became available because of greater knowledge of how to use spatial technology to identify them.

We will update replacement plans as new research happens, and we will include studies and new information specific to each water sharing plan in the plan's background document.

5 The consultation approach

5.1 Aboriginal engagement

Water sharing plans acknowledge Aboriginal values around water and make provisions available for Aboriginal people to access water. These provisions include:

- Aboriginal cultural water access licences – these licences may provide up to 10 ML of water for personal, domestic, cultural and spiritual purposes
- Aboriginal community development water access licence – these licences are available in some areas of NSW to support Aboriginal enterprises; these licences and the water they access must benefit the community in a way that fosters economic and social development
- native title rights – a native title holder can take and use water to exercise native title rights without needing an access licence, a water supply work approval or a water use approval.

Our Aboriginal engagement aims to ensure the recognition of Aboriginal people and communities as key stakeholders and to enable effective participation in water management.

The NSW Water Strategy includes a key priority to improve water management outcomes for Aboriginal People. The draft strategy recognises there are important issues that need to be addressed at a state-wide level to better enable the exercise of Aboriginal People's rights and access to water, within the Murray Darling Basin and in coastal regions of NSW. The strategy outlines the following actions for achieving the priority:

1. Strengthen the role of First Nations in water planning and management
2. Develop a state-wide Aboriginal water strategy
3. Provide Aboriginal ownership of and access to water for cultural and economic purposes
4. Work with First Nations to improve shared water knowledge
5. Work with Aboriginal people to maintain and preserve water-related cultural sites and landscapes.

One of the commitments in the NSW Water Strategy is the co-design of a state-wide Aboriginal Water Strategy that will identify a program of measures to deliver on Aboriginal People's water rights and interests in water management.

Aboriginal engagement involves ensuring Aboriginal communities can be informed, provide feedback and collaborate on the water sharing plan replacements. Future engagement involves implementing the Aboriginal Water Strategy to build meaningful relationships with Aboriginal stakeholders for a long-term collaborative approach and working closely with the Regional Aboriginal Water Committees to build relationships, share knowledge and work together to improve how water sharing plans provide for Aboriginal values and uses.

In inland water sources, our future Aboriginal engagement will seek to build on the information provided as part of First Nations engagement for the development of water resource plans.

5.2 Government stakeholders

We seek expertise from other government agencies while developing water sharing plans. We consult with other agencies through officer-level interagency working groups that feed directly into developing the plan. A more senior group of agency staff advises decision-making and ultimately supports the plans as we finalise them.

As the 'Project governance' section of this guide describes, the agencies the department collaborates with during plan development include but are not limited to:

- Department of Primary Industries – Fisheries
- Department of Primary Industries – Agriculture
- Department of Climate Change, Energy, Environment and Water – Biodiversity, Conservation and Science
- WaterNSW
- Natural Resources Access Regulator
- Murray Darling Basin Authority (for inland plans only)
- Commonwealth Environmental Water Office (for inland plans only).

We contact other government agencies for plan-specific expertise as necessary.

5.3 Targeted consultation

While developing replacement water sharing plans, we may complete targeted consultation:

- on issues identified during the life of the previous plan to inform plan replacement
- when we are seeking early information from key water users on how the plan has been working to inform plan replacement
- as part of the replacement process ahead of or post formal public consultation to test possible rule changes.

This would occur when we need feedback from specific stakeholders, such as local council. When necessary, we will contact stakeholders directly to discuss the issue relevant to the stakeholder or stakeholder group.

5.4 Public exhibition

We publicly exhibit draft replacement water sharing plans for feedback on proposed changes to a plan. During this time we seek submissions from the public through online submission forms and emails. The draft replacement plans are made available on our website, along with a

variety of documents that provide information on the background of the plan and the proposed changes for the replacement plan.

The department uses a number of consultation approaches including public webinars, face to face meetings and phone or video meetings with staff working on the plan replacement. We typically hold public consultation meetings in person in locations relevant to the water sharing plan area and generally include some online information sessions prior to the public meetings to provide relevant information to stakeholders before the face-to-face meetings. Department representatives familiar with the draft water sharing plan attend to answer questions from community members and other relevant stakeholders about the proposed changes to the plan.

The department then considers submissions and other information received during public exhibition period. Where issues raised during this phase are within the scope of the water sharing plan replacement, they may prompt changes to the draft water sharing plan.

We publish the submissions received when submitters give consent to do so and a summary of what we heard during public exhibition is provided in a 'What We Heard' document published on the department's website relevant to that water sharing plan area.

6 Regulated systems and regulated river water sharing plans

6.1 General information

Waterways in NSW can be categorised as regulated or unregulated. In NSW, the WM Act specifies that a regulated river is ‘a river that is declared by the Minister, by order published in the Gazette, to be a regulated river’. A regulated river is one that is downstream of a major water storage structure, generally a dam or weir, from which water is released to meet water orders that have been placed by water access licence holders. In contrast, water access licence holders in unregulated rivers access water during flows that are generally the result of rainfall/runoff events.

Regulated river water storages in NSW are generally operated by WaterNSW. The rules and conditions for the operation of these storages are specified in the relevant water sharing plans. Generally, a regulated system will have its own dedicated WSP covering that system only. Some smaller regulated systems (e.g., Bega Regulated River) are included in WSPs covering multiple types of water sources. Regulated river WSPs generally classify the whole regulated system into one water source. They can specify management zones to separate river reaches to allow for variations in management and dealing rules.

The following information details the sections of regulated river WSPs that differ from those in unregulated river WSPs. Other sections of these regulated river WSPs not mentioned here will have the same overall intent as for unregulated river WSPs. They will however differ between plans, as all WSPs do, based on the specific characteristics of each plan area.

6.2 Licence categories

There are different types of licence categories that can be held in regulated river systems and WSPs will define management rules for each category of licence relevant to that system. The WM Act establishes different priorities for each water access licence category and during times of low inflow this can result in some licence categories receiving reduced water allocations. Different access licences categories may have different management rules and conditions applied to them and, in the case of specific purpose category licences, may define the purpose for which extracted water can only be used. The main licence categories that can exist in regulated river systems, in order of priority as set out in the WM Act are:

- Domestic and stock and local water utility
- Regulated river (high security)
- Regulated river (general security)
- Supplementary water.

6.3 Accounting rules

Each water access licence has its own water allocation account. The water allocation account acts like a bank account where water is both credited and debited. Water is credited to an account in accordance with a relevant available water determination or if water allocation is traded in (purchased) during the year from other licence holders. In regulated river systems, available water determinations are made whenever water becomes available for sharing.

Available water determinations are made for categories and subcategories of access licence in accordance with the available water determination rules set out in the respective water sharing plan. These rules must distribute the available water in accordance with the priorities set out in the WM Act.

Available water determinations are expressed as either a percentage of the share component (for licences with share components in megalitres per year) or megalitres per share (for licences with share components in a number of shares). When applied to each licence, the available water determination results in a volume of water being credited to the respective access licence water allocation account. Water allocations for licence categories per WSP area are kept up to date on the department's [Accounting rules summary](#) website.

Water is generally debited from the account when water is extracted or traded out (sold). Total extraction from a work (pump, bore, etc.) will be measured via metering or logbooks. A licence holder's account is not permitted to go into debit.

WSPs specify the rules for the operation of water allocation accounts for each category of licence. For example, some WSPs permit water allocations to be carried over from one water year to the next. The rules for how much water can be carried over, held or extracted in a water year vary between licence types and WSPs. More information on water accounting and specific rules per WSP area can be found on the department's [Water Accounting](#) webpage.

6.4 Access to water

To extract water from a regulated river water source under an access licence, other than a supplementary water or floodplain harvesting access licence, the holder must place an order with WaterNSW for it to be delivered to the relevant extraction point. The water order must be made within the number of days prior to extraction as specified in the access licence or relevant water supply work approval condition statement.

If the water order is accepted by WaterNSW, water is then delivered to the extraction point during the requested period. Regulated river water sharing plans have different types of debiting rules. Some require the amount of water extracted to be debited from the respective water allocation account while others require the greater of the water ordered and the water extracted to be debited.

6.5 Long-term average annual extraction limits

All WSPs establish Long Term Average Annual Extraction Limits (LTAAELs). Regulated river WSPs typically require the LTAAEL to be calculated using long-term computer models which are set to determine average annual extractions under specific scenarios, for example the level of water use development and management rules that applied in a particular year before the first WSP was gazetted.

Compliance with the LTAAEL is generally also assessed using a long-term computer model, but this model represents current water use development and management rules. Should long-term average annual extractions under the current water use development and management rules model exceed the LTAAEL by more than the thresholds set out in the WSP then future water availability for lower priority access licences will be reduced.

6.6 Uncontrolled flows

Uncontrolled flows in regulated systems are excess flows that cannot be captured, or 're-regulated', into storages. When wet weather events result in flows that cannot be captured in storage structures such as dams or weirs, and the water is not needed to meet current demands or commitments, then it is considered surplus to requirements.

Uncontrolled flow events can occur in any regulated system at any time and therefore access is opportunistic and based on weather events. The amount and location of rainfall and consequent streamflow, and the catchment conditions at the time are all factors that contribute to this type of flow event occurring. Because they are naturally occurring high flows, they can provide the environmental triggers for a range of ecological processes and events and can often result in the filling of wetlands and their restoration. Therefore, the way in which uncontrolled flows are managed and accessed has important environmental and productivity consequences.

Regulated river WSPs can permit the taking of uncontrolled flows in the following two ways either under:

- a supplementary water access licence
- a regulated river (high security) or regulated river (general security) access licence.

Extraction of water under a supplementary water access licence can only occur in accordance with announcements made by WaterNSW. Regulated river WSPs establish rules which determine when WaterNSW can make such announcements (e.g., when specified flow thresholds are reached) as well as how much water can be extracted. Regulated river WSPs will typically protect a share of each uncontrolled flow event for the environment.

Supplementary water licence holders are generally required to inform WaterNSW of their intent to take water during a supplementary water event before announcements are made.

Some regulated river WSPs allow regulated river (high security) and regulated river (general security) access licences to take water that has not been allocated to them by an available

water determination from uncontrolled flows. These rules effectively allow those licences to take water from uncontrolled flows when allocations are less than 1 ML per share (or 100%). This take of uncontrolled flow is only debited from their licence account if additional available water determinations are made during the same water year after the uncontrolled take occurs.

6.7 System operation rules

Regulated river WSPs establish system operation rules which generally set out how WaterNSW is to operate the dams, weirs and regulators within the water source. System operation rules include planned environmental water rules and more general rules such as replenishment flows, storage reserve rules, delivery constraint rules and rules for operation during floods.

Planned environmental water rules will vary between regulated river WSPs. They can include rules which require:

- releases to be made from headwater storages under specific circumstances (for example, transparent and translucent releases)
- minimum flows to be maintained at certain points in the water source (for example, the end of the water source)
- specific quantities of water to be set aside in storage in an environmental water account (environmental water allowances).

6.7.1 Transparent and translucent releases

Transparent release rules require all inflows up to a specified inflow rate to be passed through the storage and be protected from licensed extraction to a particular point in the water source. The purpose of a transparent release is to provide a flow downstream of the storage that is as natural as possible up to a particular flow rate.

Translucent releases are similar to transparent releases. However, only a specified portion of the total inflow is released, thereby providing downstream flows that have a pattern similar to natural but not of the same volume.

WSPs can specify the conditions that trigger when releases are to be made. Conditions can include a date range (often seasonal), catchment conditions (wet or dry), storage levels above which releases are to be made, and limits to how much can be released in a water year.

The general intent of transparent or translucent flows is to restore natural flow variability associated with specific flow ranges. These flows can contribute towards achieving specific environmental outcomes, such as:

- connections between different parts of the river, and
- maintaining triggers for breeding conditions for native fish.

6.7.2 Minimum flows

Minimum flow rules require a specified flow to be maintained at a particular point (usually a gauge) in the water source to maintain hydrological connectivity and protect environmental values within, and in the case of end of system flow rules, downstream of the water source.

6.7.3 Environmental water allowances

Environmental water allowances refer to an amount of stored water that is kept aside to be released for purposes such as:

- watering environmental assets
- supporting ecological processes
- addressing water quality issues (for example, blue-green algae outbreaks), or
- cultural purposes.

Environmental water allowances are typically used similar to how licences held for environmental purposes are used.

WaterNSW releases water set aside in storages for the environmental water allowance throughout the water year in accordance with requests made by the NSW Environmental Water Manager. These are then delivered to key environmental sites along the water source. Regulated river WSPs set out rules for the crediting and debiting of these allowances and for the carrying over of unused water from one water year to the next.

7 References

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7.1 Version history

The history of versions, updates and publications are provided in Table 6.

Table 6. Version history and publication dates

Version	Action	Date
1	First published	January 2022
1	Annual update	January 2023
2	Additional bi-annual updates	October 2023 – April 2024
2	Review and approval	May 2024
2	Publish version 2	June 2024
3	Updated for regulated river WSPs plans content (Section 6)	June 2024
3	Publish version 3	July 2024

Appendix A.

Status of water sharing plans

Table 7 provides information on all current and previous water sharing plans within NSW.

Table 7. Water sharing plans in NSW

Plan	Plan replaced as	Plan replaced as	Region
<u>Water Sharing Plan for the Adelong Creek Water Source 2003</u>	<u>Water Sharing Plan for the Murrumbidgee Unregulated and Alluvial Water Sources 2012 (plans consolidated)</u>	<u>Water Sharing Plan for the Murrumbidgee Unregulated Water Source 2012 (plan split)</u> <u>Water Sharing Plan for the Murrumbidgee Alluvial Water Sources 2020 (plan split and consolidated with others)</u>	Inland
<u>Water Sharing Plan for the Alstonville Plateau Groundwater Sources 2003</u>	<u>Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016 (plans consolidated)</u>		Coastal
<u>Water Sharing Plan for the Apsley River Water Source 2003</u>	<u>Water Sharing Plan for the Macleay Unregulated and Alluvial Water Sources 2016 (plans consolidated)</u>		Coastal
<u>Water Sharing Plan for the Barwon-Darling Unregulated and Alluvial Water Sources 2012</u>	<u>Water Sharing Plan for the Barwon-Darling Unregulated Water Sources 2012 (plan split)</u> <u>Water Sharing Plan for the Darling Alluvial Water Sources 2020 (plan split and consolidated with others)</u>		Inland
<u>Water Sharing Plan for the Bellinger River Area Unregulated and Alluvial Water Sources 2008</u>	<u>Water Sharing Plan for the Bellinger River Area Unregulated and Alluvial Water Sources 2020</u>		Coastal
<u>Water Sharing Plan for the Belubula Regulated River Water Source 2012</u>			Inland

<u>Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources 2011</u>	<u>Water Sharing Plan for the Bega River Area Regulated, Unregulated and Alluvial Water Sources 2023</u> (now covering the water sources previously managed under the <u>Water Sharing Plan for the Murrah-Wallaga Area Unregulated and Alluvial Water Sources 2010</u> and the <u>Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources 2011</u>)	<u>Water Sharing Plan for the Bega River Area Regulated, Unregulated and Alluvial Water Sources 2024</u>	Coastal
<u>Water Sharing Plan for the Brunswick Unregulated and Alluvial Water Sources 2016</u>			Coastal
<u>Water Sharing Plan for the Castlereagh River above Binnaway Water Source 2003</u>	<u>Water Sharing Plan for the Castlereagh River Unregulated and Alluvial Water Sources 2011</u> (plans consolidated)	<u>Water Sharing Plan for the Castlereagh Unregulated River Water Sources 2011</u> (plan split) <u>Water Sharing Plan for the Macquarie -Castlereagh Groundwater Sources 2020</u> (plan split and consolidated with others)	Inland
<u>Water Sharing Plan for the Clarence River Area Unregulated and Alluvial Water Sources 2016</u>			Coastal
<u>Water Sharing Plan for the Clyde River Unregulated and Alluvial Water Sources 2016</u>			Coastal
<u>Water Sharing Plan for the Coffs Harbour Area Unregulated and Alluvial Water Sources 2009</u>	<u>Water Sharing Plan for the Coffs Harbour Area Unregulated and Alluvial Water Sources 2022</u>		Coastal
<u>Water Sharing Plan for the Commissioners Waters Water Source 2003</u>	<u>Water Sharing Plan for the Macleay Unregulated and Alluvial Water Sources 2016</u> (plans consolidated)		Coastal

<u>Water Sharing Plan for the Coopers Creek Water Source 2003</u>	<u>Water Sharing Plan for the Richmond River Area Unregulated, Regulated and Alluvial Water Sources 2010 (plans consolidated)</u>	<u>Water Sharing Plan for the Richmond River Area Unregulated, Regulated and Alluvial Water Sources 2023</u>	Coastal
<u>Water Sharing Plan for the Deua Unregulated and Alluvial Water Sources 2016</u>			Coastal
<u>Water Sharing Plan for the Dorrigo Plateau Surface Water Source and Dorrigo Basalt Groundwater Source 2003</u>	<u>Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016 (plans consolidated)</u> <u>Water Sharing Plan for the Clarence River Unregulated and Alluvial Water Sources 2016 (plans consolidated)</u>		Coastal
<u>Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources 2011</u>	<u>Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources 2023</u>		Coastal
<u>Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011</u>	<u>Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2023</u>		Coastal
<u>Water Sharing Plan for the Gwydir Regulated River Water Source 2002</u>	<u>Water Sharing Plan for the Gwydir Regulated River Water Source 2016</u>		Inland
<u>Water Sharing Plan for the Hastings Unregulated and Alluvial Water Sources 2019</u>			Coastal
<u>Water Sharing Plan for the Hunter Regulated River Water Source 2003</u>	<u>Water Sharing Plan for the Hunter Regulated River Water Source 2016</u>		Coastal
<u>Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009</u>	<u>Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2022</u>		Coastal

<u>Water Sharing Plan for the Intersecting Streams Water Sources 2011</u>	<u>Water Sharing Plan for the Intersecting Streams Unregulated Water Sources 2011 (plan split)</u> <u>Water Sharing Plan for the Darling Alluvial Groundwater Sources 2020 (plan split and consolidated with others)</u>		Inland
<u>Water Sharing Plan for the Jilliby Jilliby Creek Water Source 2003</u>	<u>Water Sharing Plan for the Central Coast Unregulated Water Sources 2009 (plans consolidated)</u>	<u>Water Sharing Plan for the Central Coast Unregulated Water Sources 2022</u>	Coastal
<u>Water Sharing Plan for the Kangaroo River Water Source 2003</u>	<u>Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources 2011 (plans consolidated)</u>	<u>Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources 2023</u>	Coastal
<u>Water Sharing Plan for the Karuah River Water Source 2003</u>	<u>Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources 2009 (plans consolidated)</u>	<u>Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources 2022</u>	Coastal
<u>Water Sharing Plan for the Kulnura Mangrove Mountain Groundwater Sources 2003</u>	<u>Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016 (plans consolidated)</u>		Coastal
<u>Water Sharing Plan for the Lachlan Regulated River Water Source 2003</u>	<u>Water Sharing Plan for the Lachlan Regulated River Water Source 2016</u>		Inland
<u>Water Sharing Plan for the Lower Gwydir Groundwater Source 2003</u>	<u>Water Sharing Plan for the Lower Gwydir Groundwater Source 2019</u>	<u>Water Sharing Plan for Gwydir Alluvial Groundwater Sources 2020 (plan consolidated with others)</u>	Inland
<u>Water Sharing Plan for the Lower Lachlan Groundwater Sources 2003</u>	<u>Water Sharing Plan for the Lachlan Alluvial Groundwater Sources 2020 (plan consolidated with others)</u>		Inland
<u>Water Sharing Plan for the Lower Macquarie Groundwater Sources 2003</u>	<u>Water Sharing Plan for the Lower Macquarie Groundwater Sources 2019</u>	<u>Water Sharing Plan for the Macquarie -Castlereagh Groundwater Sources 2020</u>	Inland

		(plan consolidated with others)	
<u>Water Sharing Plan for the Lower Murray Groundwater Source 2003</u>	<u>Water Sharing Plan for the Lower Murray Groundwater Source 2019</u>	<u>Water Sharing Plan for the Murray Alluvial Groundwater Sources 2020</u> (plan consolidated with others)	Inland
<u>Water Sharing Plan for the Lower Murray Shallow Groundwater Source 2012</u>	<u>Water Sharing Plan for the Murray Alluvial Groundwater Sources 2020</u>		Inland
<u>Water Sharing Plan for the Murray Unregulated and Alluvial Water Sources 2011</u>	<u>Water Sharing Plan for the Murray Unregulated Water Sources 2011</u> (plan split) <u>Water Sharing Plan for the Murray Alluvial Groundwater Sources 2020</u> (plan split and consolidated with others)		Inland
<u>Water Sharing Plan for the Lower Murray Darling Unregulated and Alluvial Water Sources 2011</u>	<u>Water Sharing Plan for the Lower Murray Darling Unregulated Water Source 2011</u> (plan split) <u>Water Sharing Plan for the Murray Alluvial Groundwater Sources 2020</u> (plan split and consolidated with others)		Inland
<u>Water Sharing Plan for the Lower Murrumbidgee Groundwater Sources 2003</u>	<u>Water Sharing Plan for the Lower Murrumbidgee Groundwater Sources 2019</u>	<u>Water Sharing Plan or the Murrumbidgee Alluvial Groundwater Sources 2020</u> (plan consolidated with others)	Inland
<u>Water Sharing Plan for the Macleay Unregulated and Alluvial Water Sources 2016</u>			Coastal
<u>Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources 2012</u>	<u>Water Sharing Plan for the Macquarie Bogan Unregulated Rivers Water Sources 2012</u> (plan split) <u>Water Sharing Plan for the Macquarie-Castlereagh Groundwater Sources 2020</u> (plan split and consolidated with others)		Inland
<u>Water Sharing Plan for the Macquarie and Cudgegong</u>	<u>Water Sharing Plan for the Macquarie and Cudgegong</u>		Inland

<u>Fractured Rock Groundwater Sources 2012</u>	<u>Fractured Rock Groundwater Sources 2020</u>		
<u>Water Sharing Plan for the NSW Murray Darling Basin Porous Rock Groundwater Sources 2012</u>	<u>Water Sharing Plan for the NSW Murray Darling Basin Porous Rock Groundwater Sources 2020</u>		Inland
<u>Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources 2003</u>	<u>Water Sharing Plan for the New South Wales Murray and Lower Darling Regulated Rivers Water Sources 2016</u>		Inland
<u>Water Sharing Plan for the Ourimbah Creek Water Source 2003</u>	<u>Water Sharing Plan for the Central Coast Unregulated Water Sources 2009 (plans consolidated)</u>	<u>Water Sharing Plan for the Central Coast Unregulated Water Sources 2022</u>	Coastal
<u>Water Sharing Plan for the Paterson Regulated River Water Source 2007</u>	<u>Water Sharing Plan for the Paterson Regulated River 2019</u>		Coastal
<u>Water Sharing Plan for the Peel Valley Regulated, Unregulated, Alluvium and Fractured Rock Water Sources 2010</u>	<u>Water Sharing Plan for the Peel Regulated River Water Source 2010</u> <u>Water Sharing Plan for the Namoi and Peel Unregulated Rivers Water Sources 2012</u> <u>Water Sharing Plan for the Namoi Alluvial Groundwater Sources 2020</u> <u>Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2020</u>	<u>Water Sharing Plan for the Peel Regulated River Water Source 2022</u>	Inland
<u>Water Sharing Plan for the Phillips Creek, Mooki River, Quirindi Creek and Warrah Creek Water Sources 2003</u>	<u>Water Sharing Plan for the Namoi Unregulated and Alluvial Water Sources 2012</u>	<u>Water Sharing Plan for the Namoi and Peel Unregulated Rivers Water Sources 2012 (plan split and consolidated with others)</u> <u>Water Sharing Plan for the Namoi Alluvial Groundwater Sources 2020 (plan split and consolidated with others)</u>	Inland
<u>Water Sharing Plan for the Richmond River Area Unregulated, Regulated</u>	<u>Water Sharing Plan for the Richmond River Area Unregulated, Regulated</u>		Coastal

<u>and Alluvial Water Sources 2010</u>	<u>and Alluvial Water Sources 2023</u>		
<u>Water Sharing Plan for the Rocky Creek, Cobbadah, Upper Horton and Lower Horton Water Source 2003</u>	<u>Water Sharing Plan for the Gwydir Unregulated and Alluvial Water Sources 2012</u>	<u>Water Sharing Plan for the Gwydir Unregulated River Water Sources 2012</u> (plan split) <u>Water Sharing Plan for the Gwydir Alluvial Groundwater Sources 2020</u> (plan split and consolidated with others)	Inland
<u>Water Sharing Plan for the Snowy Genoa Unregulated and Alluvial Water Sources 2016</u>			Coastal
<u>Water Sharing Plan for the South Coast Groundwater Sources 2016</u>			Coastal
<u>Water Sharing Plan for the Stuarts Point Groundwater Source 2003</u>	<u>Water Sharing Plan for the North Coast Coastal Sands Groundwater Sources 2016</u> (plans consolidated)		Coastal
<u>Water Sharing Plan for the Tarcutta Creek Water Source 2003</u>	<u>Water Sharing Plan for the Murrumbidgee Unregulated and Alluvial Water Sources 2012</u>	<u>Water Sharing Plan for the Murrumbidgee Unregulated River Water Sources 2012</u> (plan split) <u>Water Sharing Plan for the Murrumbidgee Alluvial Groundwater Sources 2020</u> (plan split and consolidated with others)	Inland
<u>Water Sharing Plan for the Tenterfield Creek Water Source 2003</u>	<u>Water Sharing Plan for the NSW Border Rivers Unregulated and Alluvial Water Sources 2012</u>	<u>Water Sharing Plan for the NSW Border Rivers Unregulated Water Sources 2012</u> (plan split) <u>Water Sharing Plan for the NSW Border Rivers Alluvial Groundwater Sources 2020</u> (plan split)	Inland
<u>Water Sharing Plan for the Tomago Tomaree Stockton Groundwater Sources 2003</u>	<u>Water Sharing Plan for the North Coast Coastal Sands Groundwater Sources 2016</u> (plans consolidated)		Coastal
<u>Water Sharing Plan for the Towamba River</u>	<u>Water Sharing Plan for the Towamba River</u>		

<u>Unregulated and Alluvial Water Sources 2010</u>	<u>Unregulated and Alluvial Water Sources 2023</u>		
<u>Water Sharing Plan for the Toorumbree Creek Water Source 2003</u>	<u>Water Sharing Plan for the Macleay Unregulated and Alluvial Water Sources 2016 (plans consolidated)</u>		Coastal
<u>Water Sharing Plan for the Tweed River Area Unregulated and Alluvial Water Sources 2010</u>	<u>Water Sharing Plan for the Tweed River Area Unregulated and Alluvial Water Sources 2023</u>		Coastal
<u>Water Sharing Plan for the Tuross River Unregulated and Alluvial Water Sources 2016</u>			Coastal
<u>Water Sharing Plan for the Upper and Lower Namoi Groundwater Sources 2003</u>	<u>Water Sharing Plan for the Upper and Lower Namoi Groundwater Sources 2019</u>	<u>Water Sharing Plan for the Namoi Alluvial Groundwater Sources 2020 (consolidated with others)</u>	Inland
<u>Water Sharing Plan for the Upper Billabong Water Source 2003</u>	<u>Water Sharing Plan for the Murrumbidgee Unregulated and Alluvial Water Sources 2012</u>	<u>Water Sharing Plan for the Murrumbidgee Unregulated River Water Sources 2012 (plan split)</u> <u>Water Sharing Plan for the Murrumbidgee Alluvial Groundwater Sources 2020 (plan split and consolidated with others)</u>	Inland
<u>Water Sharing Plan for the Upper Brunswick River Water Source 2003</u>	<u>Water Sharing Plan for the Brunswick Unregulated and Alluvial Water Sources 2016 (plans consolidated)</u>		Coastal
<u>Water Sharing Plan for the Upper Namoi and Lower Namoi Regulated River Water Sources 2003</u>	<u>Water Sharing Plan for the Upper Namoi and Lower Namoi Regulated River Water Sources 2016</u>		Inland
<u>Water Sharing Plan for the Wandella Creek Water Source 2003</u>	<u>Water Sharing Plan for the Tuross River Unregulated and Alluvial Water Sources 2016 (plans consolidated)</u>		Coastal
<u>Water Sharing Plan for the Wybong Creek Water Source 2003</u>	<u>Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009 (plans consolidated)</u>	<u>Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2022</u>	Coastal

Appendix B.

Updated risk assessment framework

Risk assessment framework

To manage NSW water resources, it is important to identify risks to the volume and quality of the resource, and subsequent risks to the users and the environment that rely on the resource. Risk assessment is a well-understood and accepted approach for managing natural resources. The consequences of impacts on natural resources are often hard to predict. Therefore, risk assessment relies on the probabilities of impacts occurring.

NSW has been implementing risk-based water planning processes since the late 1990s, including the Stressed Rivers Assessments in 1998 (Department of Land and Water Conservation, 1998a), the Aquifer Risk Assessment (Department of Land and Water Conservation, 1998b) and the macro water planning process developed in 2004 to complete water sharing plans across the state (NSW Office of Water 2011).

The risk assessment framework adopts a cause/threat/impact model that describes the pathway for impacts to a receptor. This approach provides a systematic way to identify a range of factors that may lead to an impact. It is also consistent with the internationally recognised risk standard that considers both likelihood and consequence.

Causes have the potential to induce a threat to various extents, depending on the characteristics of the water resource. Table 8 summarises the causes, threats and impacts we considered in this assessment.

Table 8. Summary of causes, threats and impacts we considered in this risk assessment

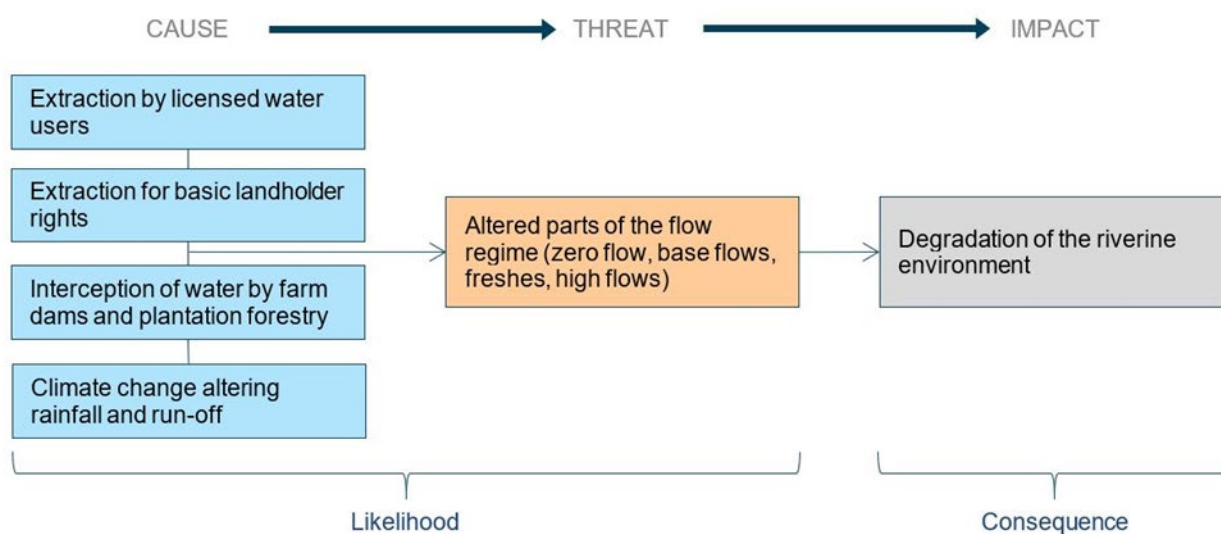
Cause	Threat	Impact
<ul style="list-style-type: none"> Regulation of river flows by dams and weirs Extraction by licensed water users Extraction for BLRs Interception of water by farm dams, mining and plantation forestry Climate change altering rainfall, run-off and recharge to groundwater Land management changes effecting landscape processes 	<ul style="list-style-type: none"> Altered parts of the flow regime (zero flow, base flows, freshes, high flows) Reduced connected alluvial groundwater levels Poor water quality (temperature depression, suspended matter, nutrients, dissolved oxygen, pH, salinity) Decline in groundwater levels 	<ul style="list-style-type: none"> Degradation of the riverine environment Degradation of the connected groundwater-dependent environment Degradation of the estuarine environment Loss of water quality suitability for water use

The risk level of an impact is a function of the **likelihood** of a cause and threat occurring, and the **consequence** of the impact on the receptor. For this risk assessment, we have adopted the following definitions:

- likelihood – the probability that a cause will result in a threat. It is not an indication of the size of the threat but rather conveys the probability that the threat will be significant
- consequence – the loss of value for an impacted receptor.

Figure 2 illustrates an example of how the cause/threat/impact model and likelihood/consequence standard have been combined for risks arising from river regulation and surface water extraction.

Figure 2. Example of an impact pathway for identifying the risks to the environment associated with altering parts of the flow regime



A risk formula is developed from the impact pathway that elaborates on the response or causation model and the metrics that are used to quantify (or qualify) the consequence, and the likelihood of that consequence (shown in Table 9).

Table 9. Formula for deriving risk to in-stream riverine environmental assets from altering the flow regime

Risk equals	consequence and	likelihood
There is a risk of insufficient water being available to maintain key ecosystem functions in unregulated rivers.	This risk may lead to loss of in-stream riverine ecological values.	This loss would stem from an altered flow regime caused by water extraction, interception, and climate change.

We calculate risk levels using a standard risk assessment matrix (Figure 3 below). However, specific risk matrices may have been developed for some risks.

Figure 3. Standard risk assessment matrix

		Likelihood		
		Low	Medium	High
Consequence	Very low	Low	Low	Low
	Low	Low	Low	Medium
	Medium	Low	Medium	High
	High	Low	Medium	High
	Very high	Medium	High	High

How is this risk assessment related to the macro planning approach?

This risk assessment builds on our previously used macro planning approach by:

- assessing likelihood and consequence at a river reach scale as opposed to a catchment or sub-catchment (water source) scale
- assessing the risk of impact on different parts of the hydrograph (for example, low flows, freshes and high flows)
- considering additional causes of flow alteration.

Using this approach means that some water sources may have a risk category different from those determined when the initial water sharing plans were written.

What is the scope of this risk assessment?

Coastal

This risk assessment evaluates current or future risks that directly relate to the quantity or quality of water in the water source. This risk assessment includes risk mitigation strategies that can be implemented through the water sharing plan – for example, improving flow for fish passage – for discussion in future options assessment workshops. Where mitigation strategies are not available through a water sharing plan, they are identified in the risk assessment but not considered further – for example, managing land-use practices.

This risk assessment evaluates:

- risks of insufficient water for freshwater riverine ecosystems
- risks of poor water quality for freshwater riverine ecosystems
- consequences of insufficient water for GDEs connected to the rivers
- risks of insufficient water for estuarine ecosystems
- risk of unsuitable water quality for other water uses (irrigation and recreation).

There are some risks to water sharing plan outcomes that this assessment will not address. This assessment **does not** evaluate:

- risks of change in water quality for GDEs connected to the rivers
- risks of poor water quality for estuarine ecosystems
- risks of insufficient water or poor water quality for Aboriginal values and uses
- risks of insufficient water for stock and domestic uses
- risks of insufficient water for consumptive uses
- risks of insufficient water and poor water quality for other social and economic outcomes
- risks raised by stakeholders during targeted consultation by the department.

Inland

NSW completed risk assessments to meet the Basin Plan requirements as part of developing water resource plans. Based on these requirements, the criteria adopted for including cause/threat/impact combinations in this assessment are that:

- the risk directly relates to a change in the water resource, which may change the quantity or quality of the resource
- risks for which the cause or threat would be mitigated by using NSW water management tools, such as rules within a water sharing plan.

We have not qualitatively assessed risks identified in the Basin Plan that do not have an apparent cause/threat/impact pathway in a water resource context. Rather, we have provided appropriate commentary to document a clear rationale. Alternatively, we reference other supporting documents. Establishing the time frame for the risk assessment determines the point from which we will assess the potential for impact. As the Basin Plan requires, this risk assessment identifies and assesses current and future risks.

We have adopted the following definitions:

- current risk – the risk that exists before the commencement of the water sharing plans and before the application of any new or altered water management actions and mechanisms and strategies. We have assessed current risk with the existing water sharing plan rules based on the WM Act set in place
- future risk – this risk may affect the condition or continued availability of water resources during or subsequent to the 10-year term of relevant water sharing plans. We also assess future risk with the existing water sharing plan or WM Act-based strategy set in place. Future risks that we have assessed include risk to the environment and to licensed water users from growth in water use by BLRs (both domestic and stock, and farm dam interception), interception activities (including plantation forestry and farm dams) and climate change.

As noted above, many water management actions and mechanisms are already in place that may adequately address risk. The purpose of this risk assessment is therefore to review the risks and associated management measures for current and future effectiveness, and to verify whether the level of water resource management matches the level of risk.

Limitations and uncertainties

This risk assessment uses the best data currently available. We use quantitative state-wide data where possible to maintain consistency between water sharing plan areas. If not available, we may use qualitative or local data sets. We may also use data not currently available for all areas but that is part of an ongoing program and provides significant benefit to the risk assessment – for example, NSW coastal climate change risk assessments.

Appendix C.

Method for measuring productivity loss for socio economic assessment

Productivity loss is measured as the impact of an additional cease to pump day on the daily production potential. The production potential of the land is assumed to be 100% in the absence of any cease to pump days. Productivity loss is the foregone output during the productivity decline and recovery phases due to the additional cease to pump. The impact of proposed rule changes is calculated as follows:

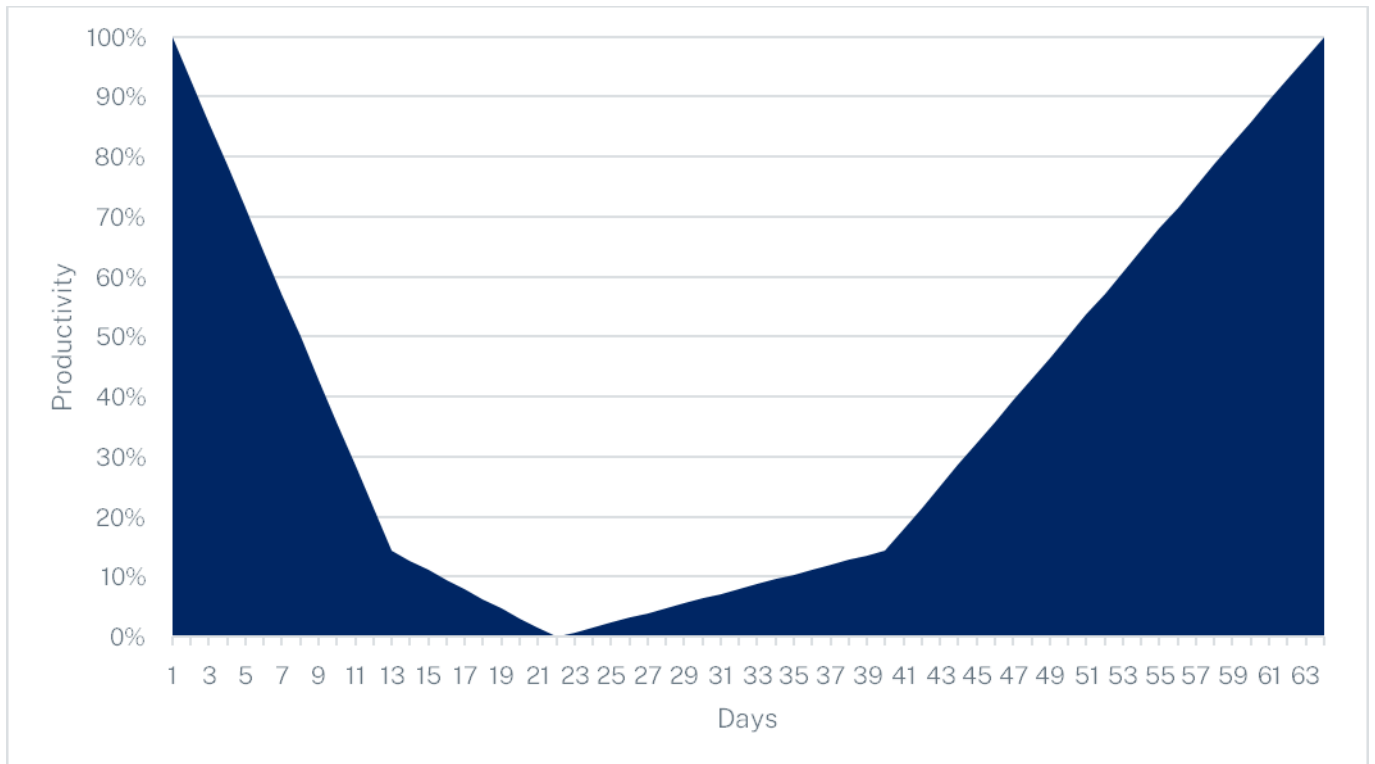
1. A base case level of production is estimated using 20 years of historical flow data and current cease to pump rules to determine the number of cease to pump days for summer and winter.
2. Production under each option (set of proposed cease to pump rules) is calculated using the same process as the base case using the proposed rules to determine the number of cease to pump days.
3. Base case production is removed from each option to determine the marginal impact of the proposed cease to pump rules. Productivity loss will only occur if rule changes result in additional cease to pump days.

Crop production loss during and after a cease to pump is calculated in two phases, decline and recovery. During the decline phase production is calculated as follows:

- From day 1 to day 12 of a cease to pump event daily production declines by a rate of 7.14% per day.
 - This results in a 50% reduction in daily production potential over the first 8 consecutive days of a cease to pump event, and an 85% loss as a result of the first 12 consecutive days of a cease to pump event.
- From day 13 to day 21 of a cease to pump event production declines at a rate of 1.6% per day.
 - This will result in the loss of the remaining 15% production over the next 9 consecutive days of a CtP event.
- On the 21st day of a continuous cease to pump event it is assumed that the crop has failed and will need to be re-established.

The productivity recovery phase occurs when farmers can access water after a cease to pump event based on the rules in the Water Sharing plan. It is assumed that crop productivity recovers at half the rate of the productivity decline phase. This means that to recover a loss of 50% of daily production potential requires 28 consecutive days of recovery phase (compared with 8 consecutive days of the productivity decline phase). See Figure 4 for an example of productivity variation from a 21 day cease to pump.

Figure 4. Example of a 21-day CtP event



The productivity curve assumes that at the beginning of a cease to pump event an irrigator will have a portion of irrigated crop in moisture deficit. This is based on low rainfall for a period before a cease to pump event is declared. Therefore, a cease to pump event will result in immediate impact on daily productivity.

Estimating the seasonal value of production

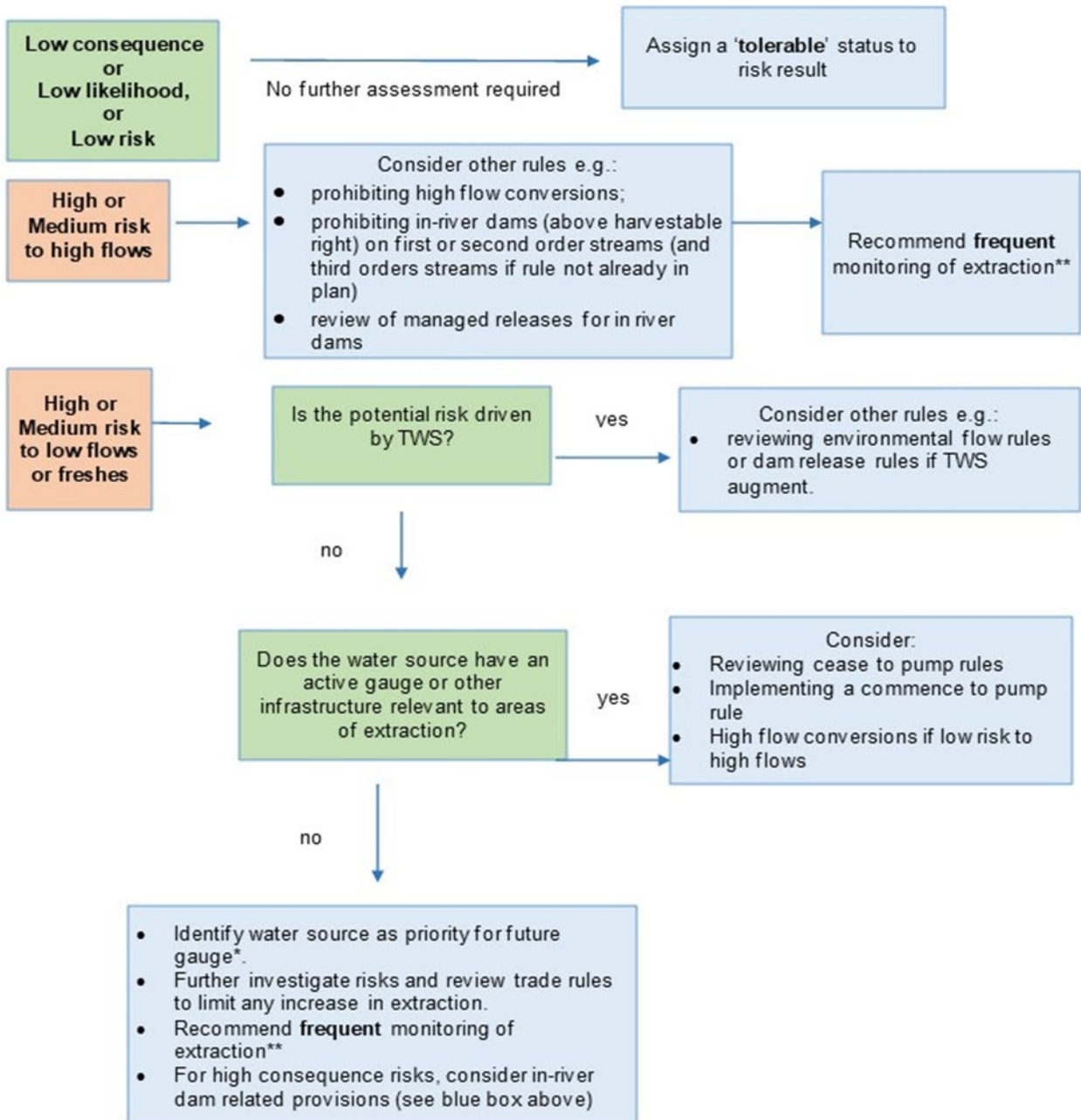
Estimating the seasonal value of production is important because farming follows a similar cycle. This means that cease to pump events will impact productivity differently at different times of the year. This assumption accounts for rainfall and temperature patterns of the region, that is, high rainfall and relatively higher temperatures over the summer months. The value of production for cropping and grazing is determined for each specific plan.

Appendix D.

Planning assessment decision tools

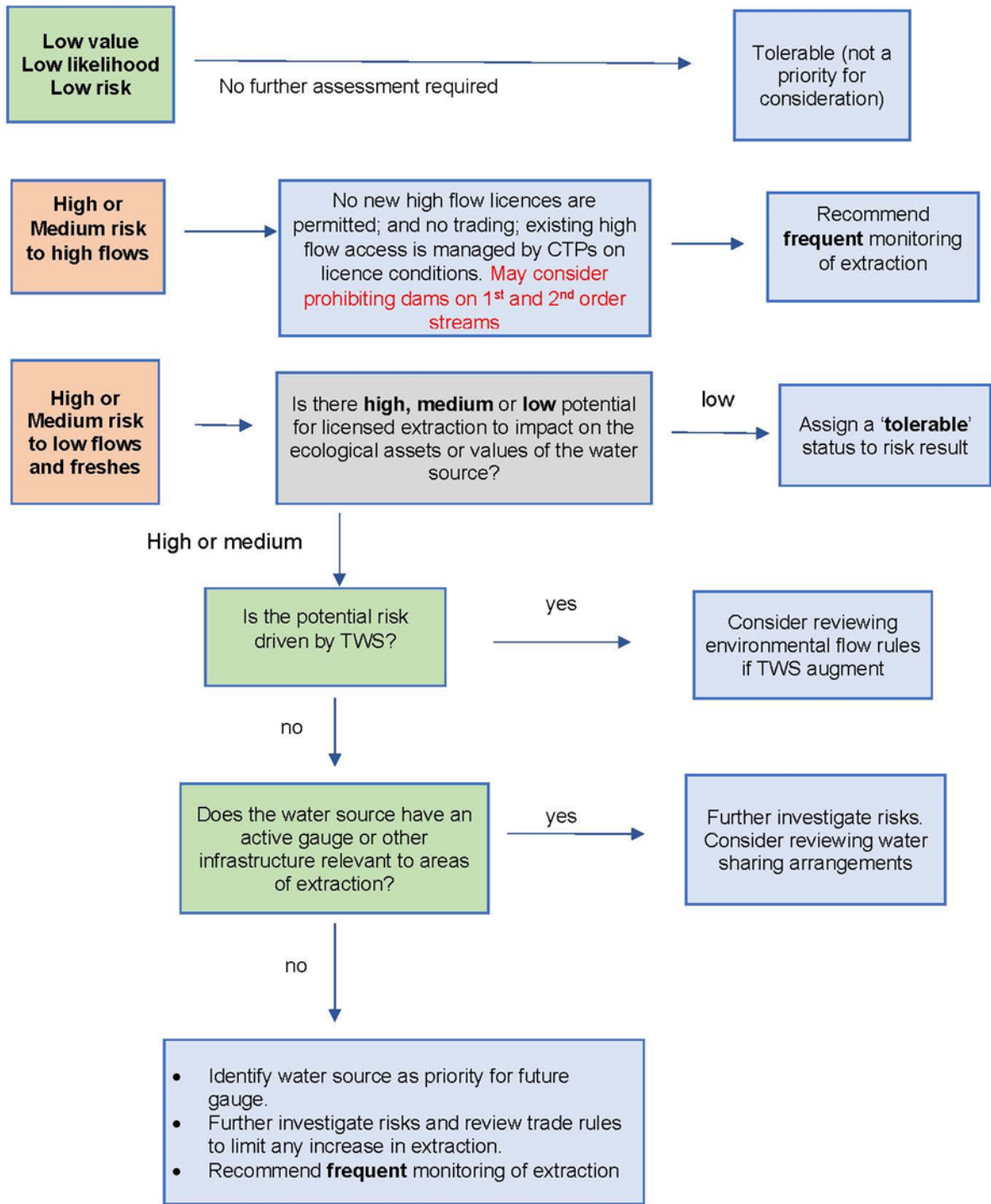
The process that Figure 5 illustrates serves as a tool to identify the need for rule changes in coastal replacement water sharing plans.

Figure 5. Coastal planning assessment to identify need for rule changes



The process that Figure 6 [Error! Reference source not found.](#) illustrates applies to inland planning assessments to determine rule changes for inland replacement water sharing plans.

Figure 6. Inland planning assessment to identify need for rule changes



Appendix E.

Method for calculating the LTAAEL for coastal floodplain alluvial groundwater sources

Table 10. Method of calculating the LTAAEL for coastal floodplain alluvial groundwater sources

Factor	How factor is calculated
Rainfall recharge	<p>Average rainfall over the water sharing plan area is calculated, excluding national parks and drains.</p> <p>An infiltration factor of 10% is applied.</p> <p>This figure considers climate change predictions (using NARcliM, the NSW and ACT Regional Climate Modelling project) in the estimate of recharge over the life of the plan.</p>
Risk assessment factor	<p>An ecological/socio-economic risk assessment is conducted, and a percentage of rainfall recharge is reserved as planned environmental water. The remaining portion is available for extraction.</p>
Planned environmental water	<p>This volume is equal to the percentage of rainfall recharge that the risk assessment determines, plus all rainfall recharge in national park areas and drains.</p>
LTAAEL	<p>The water available for extraction based on the risk assessment factor.</p>
Current and future water needs	<p>Current entitlement and estimated BLR are calculated. An estimate of future growth is determined, and a 10% buffer is applied to ensure enough water is protected for future water needs wherever possible.</p>
Unassigned water	<p>Calculated as 'water for extraction' multiplied by 80%. If this is less than current and future water needs, then there is no unassigned water available. If the calculation shows that current and future water needs are less than 80% of the LTAAEL, then unassigned water exists in the water source and may be made available through a controlled allocation.</p>

Appendix F.

Method used to estimate water requirements of basic landholder rights

The values for Basic Landholder Rights (BLR) in the unregulated water sharing plans have been estimated using both spatial and empirical data held by the department and Australian Bureau of Statistics following the process approved by the department's Planning Reference Group (PRG). The estimates may differ from estimates in the current water sharing plans due to changes in land use, changes in population and the availability of more accurate data.

Surface water sources

Surface water BLR is associated with river frontage. To estimate the volume of water used to meet domestic and stock surface water BLR requirements a buffer zone is applied around the river which determines the area of land that would be entitled to riparian (river frontage) BLR.

- *Step 1. Identify all water sources in the water sharing plan area and separate out the regulated rivers from the unregulated rivers.*

Apply the below method to each water source separately. This will result in a regulated river BLR figure and an unregulated river BLR figure.

- *Step 2. Determine buffer zones.*

The buffer zone is determined by applying a standard distance around streams based on the location of the stream within NSW and the stream order. The size of the buffer zone is determined from the draft Reasonable Use Guidelines Zone map (Figure 7) and the Stream Orders by Zone (Table 11). Stream orders were selected for each zone based on the stream's reliability to provide basic rights for the majority of the year on average.

Figure 7. Reasonable Use Guidelines Zone Map

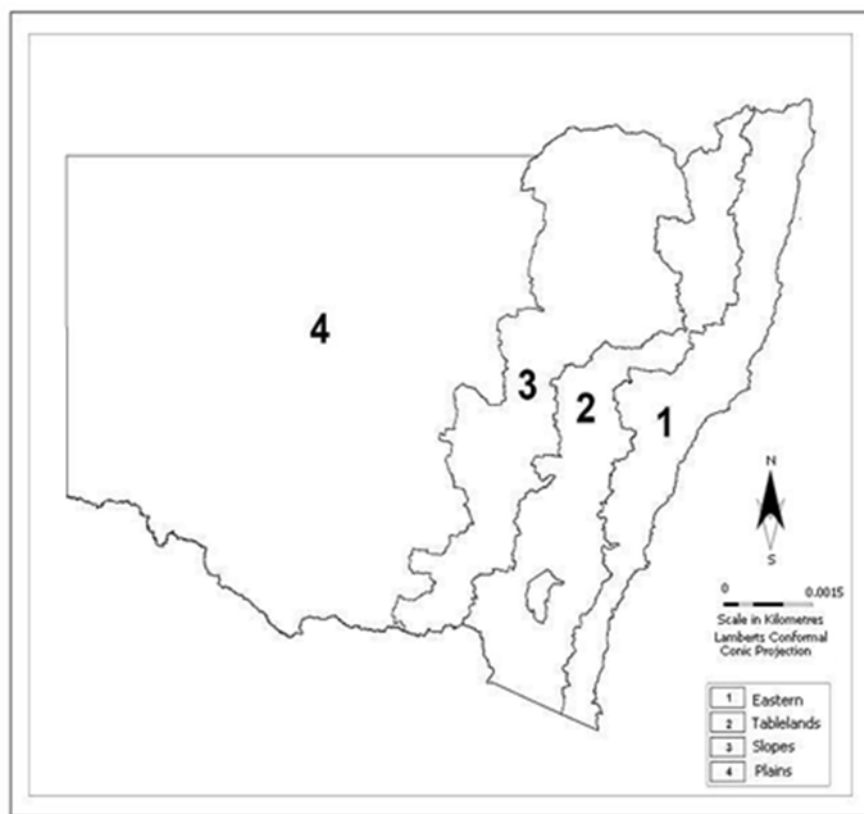


Table 11. Stream orders by zone and value of buffer applied for estimated take under BLR

Zone	Stream order	Buffer (m)
Eastern	3 rd and above	400
Tablelands	3 rd and above	400
Slopes	4 th and above	400
Plains	5 th and above	1000

For example, a buffer zone of 400m would be applied to a 3rd order or larger stream in the Eastern Zone of the state.

- *Step 3. Calculate domestic use (ML/year)*

It is assumed that domestic use within urban areas is provided by reticulated town water supply and covered by surface water and/or groundwater licences. Private surface water extraction for domestic consumption in urban areas is assumed to be negligible.

Within each buffer zone determined in step 2 remove the urban areas.

Overlay the GURAS (Geocoded Urban and Rural Address System) property addressing data held by Crown Lands.

Determine the number of dwellings in the remaining (non-urban) area of the buffer zone by counting the number of unique properties identified in the GURAS data set. This assumes that on average there is one house per property and multiple houses on a single property are balanced out by properties that are unoccupied.

Multiply the number of dwellings by the domestic consumption allowances for rural land (Table 12) to determine the rural domestic BLR volume for the buffer zone.

Table 12. Domestic water consumption for rural lots (per year) from the Reasonable Use Guidelines by zone

Zone	Rural consumption (ML/year)
Eastern/Coast	1.0
Tablelands	1.1
Slopes	1.4
Plains	2.1

The rural domestic BLR volume will be partly met by groundwater and partly by surface water.

Multiply the rural domestic BLR volume by the surface water percentage in (Table 13) to determine the proportion of surface water use within the buffered areas of each water source.

Surface water reliability is generally higher in coastal regions so it is assumed that within the buffer zone the bulk of water extracted would be from surface water with equal portions of connected alluvial groundwater and deeper groundwater.

Table 13. Assumed water use by region by source

Zone	Groundwater
Eastern	Alluvials 10% Other 10%
Tablelands	Alluvials 20% Other 10%
Slopes	Alluvials 20% Other 10%
Plains	Alluvials 30% Other 30%

- *Step 4. Calculate Stock Use (ML/year)*

Stock use was calculated by determining the area of grazing within each buffer zone for each water source.

The grazed area excludes urban areas, as it is assumed that any use within an urban area will be minor and would be accounted for as part of any local water utility licence.

Within each buffer zone determined in step 2 remove the urban areas.

Determine the area of grazing within the non-urban area of each buffer zone by calculating the area of native pastures (unimproved), improved pastures and irrigated pastures for each water source from the NSW Landuse data of 2013 that is in the SEED database.

Multiply the area of each type of pasture by the stock watering allowances for rural land (Table 14) to determine the stock use volume for that type of pasture in the water source. This takes into account the different stock water requirements in different parts of the state.

Sum the stock watering allowances for each type of pasture within the water source to get a total stock water BLR figure for the water source.

Table 14. Stock watering allowance by zone from the draft reasonable use guidelines

Zone	Pasture type	Take Allowance (ML/ha)
Eastern	Unimproved pasture	0.025
	Improved pasture	0.045
Tablelands	Unimproved pasture	0.020
	Improved pasture	0.045
Slopes	Unimproved pasture	0.015
	Improved pasture	0.045
Plains	Unimproved pasture	0.010
	Improved pasture	0.020
All zones	Irrigated pasture	0.050

- *Step 5. Calculate total BLR requirements for the surface water source.*

Sum the domestic BLR figure calculated in step 3 and the total stock BLR figure in step 4 to determine the total BLR figure for each surface water source. Sum each water source to determine BLR for regulated and unregulated water sources in the water sharing plan area.

Groundwater sources

NOTE: This method does not apply to the Coastal Floodplain Alluvial Groundwater Sources.

- Step 1. Determine the “groundwater relevant area” of the water source.

For each groundwater source remove the urban areas that are supplied by reticulated town water and remove the buffer areas determined in the surface water source methodology. The remaining area is the “groundwater relevant area” for BLR usage.

- *Step 2. Calculate Domestic Use (ML/year)*

For domestic use in the “groundwater relevant area” of the groundwater source calculate the number of houses by counting the number of unique properties identified in the GURAS property addressing data held by Crown Lands within the “groundwater relevant area” of each water source.

Calculate the domestic groundwater BLR requirement in each groundwater source by multiplying the total number of houses by the domestic consumption by rural lots in Table 12 and then the proportion of BLR that is groundwater dependent in Table 13.

- *Step 3. Calculate Stock Use (ML/year)*

Within the “groundwater relevant area” for each groundwater source identify the area of unimproved, improved, and irrigated grazed pasture using the NSW Landuse data of 2013 that is in the SEED database.

Calculate the stock watering requirements by multiplying the area of each type of pasture by the stock watering allowances for rural land (Table 14) to determine the stock use volume for that water source.

As some of the stock BLR figures will be provided by surface water calculate the volume of groundwater stock BLR by using the percentage figures by zone in Table 15.

Table 15. Estimated percentage of stocked area with significant reliance on groundwater by zone

Zone	Stock: significant reliance on groundwater (%)
Eastern/Coast	15
Tablelands	40
Slopes	50
Plains	80

- *Step 4. Calculate total BLR for each groundwater water source.*

Sum the domestic BLR figure calculated in step 2 and the total stock BLR figure in step 3 to determine the total BLR figure for each groundwater water source.

Coastal Floodplain Alluvial water sources

Count the number of Basic Landholder Rights (BLR) bores within each water source that were identified through WLS searches and spatial mapping surveys.

For each bore that is for “Stock” or “Domestic” use only an annual extraction of 1 ML BLR is assumed.

For each bore that was for “Stock and Domestic” use an annual extraction of 2 ML BLR is assumed.

Sum these two volumes to determine the total known BLR.

Expert opinion advises that the total known BLR represents approximately two thirds of all groundwater BLR extraction as there is a significant amount on unlicensed groundwater extraction such as unauthorised spear points.

Multiply the total known BLR figure by 150% to account for unknown BLR to give the total BLR figure for the water source.

Groundwater Reliance Percentages

The assumptions made for estimating reliance on groundwater by zone outside the areas that are assumed to be using primarily river and creek water are explained as follows.

For the eastern/coastal zone, high rainfall suggests water tanks and dams are likely to be used over groundwater. Access to groundwater in coastal sands areas is assumed to be by a large number of spear points. The assumptions are: domestic – assume 10%, stock - assume 15%.

For the Tablelands zone, relatively reliable rainfall suggests dams and water tanks are likely to be used over groundwater. In general groundwater access gives low yields with varying quality. The assumptions are: domestic – assume 25% of houses within the water source would use primarily groundwater over rainwater, stock – assume 40% of the grazed area within the water source would use primarily groundwater for stock watering over dams.

For the Slopes zone, less reliable rainfall suggests dams and water tanks are still likely to be used over groundwater where possible. In general groundwater access gives varying yields with varying quality. The assumptions are: domestic - assume 35% of houses within the water source would use primarily groundwater over rainwater, stock - assume 50% of the grazed area within the water source would use primarily groundwater for stock watering over dams.

For the Plains zone, unreliable rainfall suggests groundwater will be used over dams and water tanks. In general groundwater access gives varying yields with varying water quality. The assumptions are: domestic – assume 60% of houses within the water source would use primarily groundwater over rainwater, in some areas groundwater is unfit for human consumption, stock - assume 80% of the grazed area within the water source would use primarily groundwater for stock watering over dams.

Great Artesian Basin proper – alluvials and cap rock

The method we use to estimate water take for BLRs in the Great Artesian Basin is different from that we use for other parts of NSW. This is due to the climate, the dependence on groundwater and the landscape differences with the rest of the state.

The 2020 replacement plan for the Great Artesian Basin Groundwater Sources used a new method for estimating BLR. The department engaged consulting firm Klohn Crippen Berger to evaluate BLR estimates for the NSW portion of the Great Artesian Basin. The firm reviewed previous approaches to estimate BLR for the NSW groundwater sources and approaches used in the Queensland plans for the Great Artesian Basin. Klohn Crippen Berger then adapted these based on data availability and suitability, and recommended a new method for including BLR estimates in the new water sharing plan.

The recommended method combined the methods for estimating BLR in the current water sharing plan, the department's current BLR estimation method and that used in the Queensland portion of the Great Artesian Basin. This recommended method also discounted the water take from overlying groundwater sources and watercourses in estimating BLR.

The Klohn Crippen Berger report, available on our website, describes specific details of the method adopted for the 2020 Great Artesian Basin Water Sharing Plan.²⁰

Estimate of annual extraction from harvestable rights dams

In 2022 the department began work to determine estimates of current uptake of water under harvestable rights for 5 water sharing plan areas that were undergoing review and replacement. In late 2023 the department is investigating changes to this method by incorporating new technologies in remote sensing to enable more accurate estimates. The method used to this date, October 2023, is detailed below.

1. Remote sensing was used to identify dams in each water source on relevant land and water courses smaller than third order streams. Land types such as National Parks, state forests, named waterbodies and heavily developed areas were excluded as there is a low likelihood of harvestable rights dams being present on these types of land.
2. The estimated volume of each dam was determined based on its surface area.
3. Each dam was then assessed for aspect ratio (length of long side/length of short side). With this calculation a number close to 1 indicates a square (or round) body which indicates a higher

²⁰ Klohn Crippen Berger 2020, *Estimate of Basic Landholder Rights Requirements and Abstraction for the NSW Great Artesian Basin Groundwater Sources*, report prepared for the Department of Planning, Industry and Environment.

likelihood of a man made structure. A very large number such as 50 would indicate a very long thin body (such as a river) and is more likely to be a natural waterbody. Based on previous similar work, it was determined that an aspect ratio of <9.0 was the most suitable threshold for harvestable rights dams. If a dam had an aspect ratio <9.0 it was automatically assumed to be a harvestable rights dam.

4. Harvestable rights dams with a capacity greater than 100 ML on the coast are unusual and the dam is likely to exist for a different purpose such as town water supply or the result of an old quarry. Dams less than 100 ML were automatically included as harvestable rights dams.
5. All dams above the volumetric or aspect ratio limits were investigated individually and either included or excluded as harvestable rights dams. Examples of excluded dams were quarries and licenced dams.
6. The total dam capacity of all dams considered to be harvestable rights dams was then calculated per water source.

The dam capacity is not an annual volume. A dam with the same capacity would produce a smaller annual harvestable rights volume in an area with less rainfall runoff than the same dam in an area with more rainfall runoff.

The department holds a series of contours that reflect the annual runoff across NSW. These contours are called the “Harvestable Rights Multiplier”. Generally, the dryer the area the lower the Harvestable Rights Multiplier and the larger a dam must be to capture the same volume of water. This relationship is expressed numerically as a ‘Dam Reliability Factor’ (DRF) found in Table 16 below.

Table 16. Relationship between the Harvestable Rights multiplier and the Dam Reliability Factor

Harvestable rights multiplier	Corresponding Dam Reliability Factor
0.050	2.5
0.051	2.32
0.052	2.17
0.056	2.04
0.054	1.93
0.055	1.83
0.056	1.75
0.057	1.68
0.058	1.61
0.059	1.55
0.060	1.5
0.062	1.41
0.064	1.33
0.066	1.27
0.068	1.21
0.070	1.17

0.075	1.07
0.080	1
0.090	0.9
0.100	0.83
0.110	0.79
0.120	0.75
0.130	0.72
0.140	0.7
0.150	0.68
0.160	0.67
0.170	0.65
0.180	0.64
0.190	0.63

A geographic information system was used to determine the average harvestable rights multiplier per water source based on the rainfall runoff contours. Table 17 was then used to determine the corresponding Dam Reliability Factor per water source.

7. To determine the estimated annual volume of harvestable rights, the total volume held in harvestable rights dams for each water source (as calculated in step 6) was then divided by the Dam Reliability Factor for that water source.

Appendix G.

Method for creating water sharing plan flow duration curves and tables

Flow data for replacement plans can incorporate an additional 10 years of flow data, which means new flow duration tables can help understand the flow in the river. This guide aims to help the department create and analyse flow duration curves and tables.

Step 1 – Determine which gauges to get further information on

- Look at available gauges using data sources including:
 - [WaterNSW Real time data website](#)
 - [Pineena](#)
 - Talk to WaterNSW representatives
 - Consider discussing with ecohydrologist, or others who have local knowledge.
- Only use gauges with at least 10 years of data
- Consider location of gauge in the catchment and relative to water extraction. If more than one gauge in a water source the best locations are downstream of most extraction and near the end of the water source
- Consider if the gauge is suitable to measure low flows (through discussion with WaterNSW)
- Consider reliability of gauge (through discussion with WaterNSW)

Step 2. – Request cleansed flow data

Once a list of gauges is compiled send a “cleansed flow data” request to the modelling team.

For each gauge which requires data, determine whether there is a major dam (e.g., a town water supply, hydro power station) within its catchment, and what year the dam was complete. Only request data after that time as this represents the flow in the system now.

- At the moment the cleansing rules that the modelling team apply are:
 - Remove years where 20% or less of data was available for that calendar year
 - Remove “not release quality/missing” data i.e., only consider periods that have either good quality or no QA code
 - Where the gauge is downstream of major infrastructure (weir, dam etc), only consider periods after this was implemented
 - Remove repeat values (where there was clearly a gauge function issue).

Step 3 – Analyse your flow data

Data provided will be raw data. Once raw data has been inserted into the spreadsheet, it will generate an exceedance curve and a table showing both annual and monthly flows for key exceedance percentiles.

Compare current cease to pump levels to the flow duration curves based on the cleansed data. This could mean that the percentile flow has gone up or down. This is important for us to know so we can see the impact of the rule on the environment and water users but a change in percentile alone will not result in a change in cease to pump rule unless there is a large discrepancy in percentiles.

The planning reference group will be consulted and if there are no other drivers for changed access rules, the ML/day cease to pump in the current plan will remain as the ML/day cease to pump figure in the new plan and the percentile figures will be modified if necessary. Otherwise, new cease to pump levels will be investigated and planners will consult with different departmental stakeholders and interagency groups to determine the most appropriate levels.