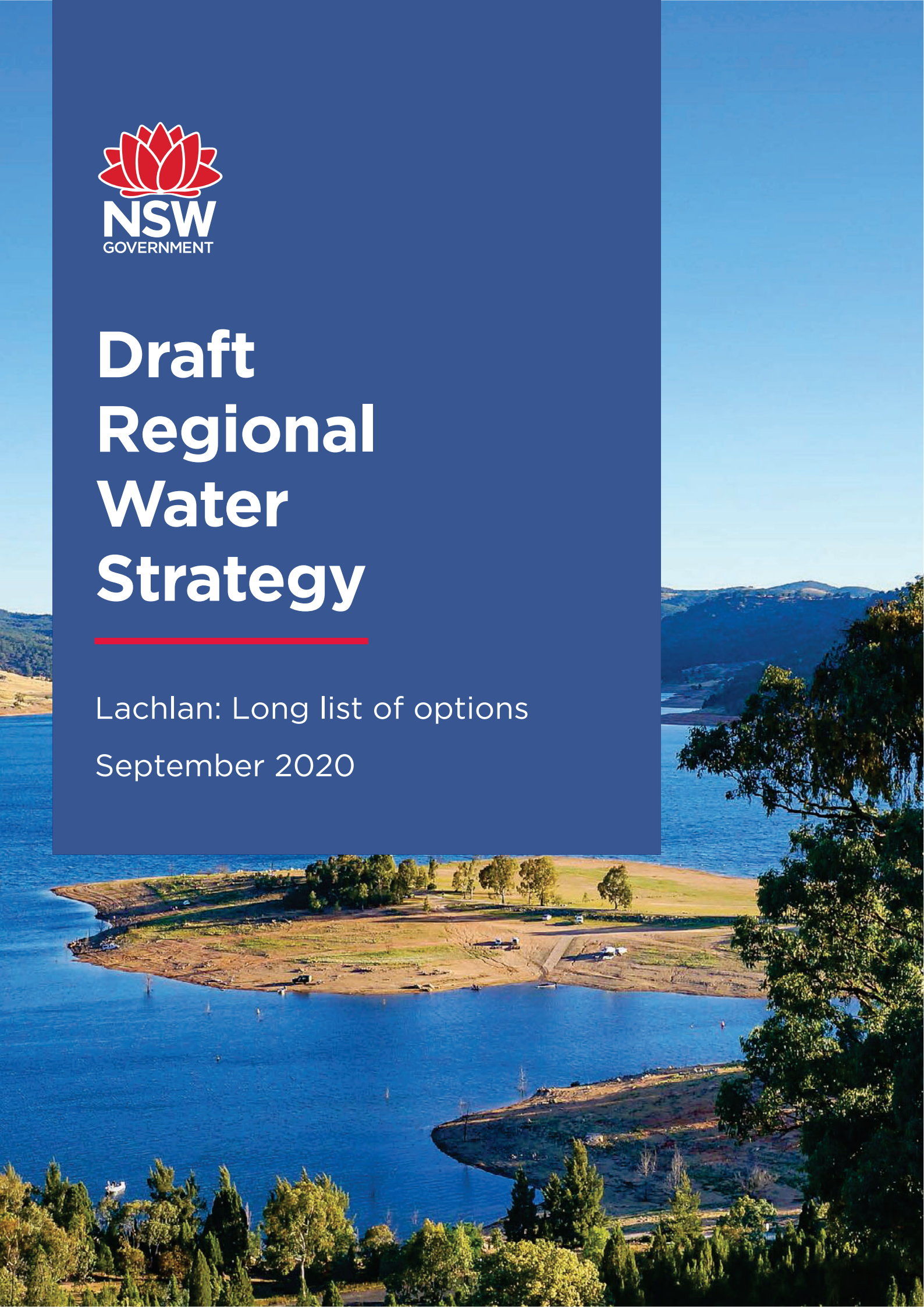
NSW GOVERNMENT

Draft Regional Water Strategy

Lachlan: Long list of options

September 2020



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The NSW Government acknowledges Aboriginal people as Australia's first people practicing the oldest living culture on earth and as the Traditional Owners and Custodians of the lands and waters.

We acknowledge that the people of the Nari Nari, Ngiyampaa, Wiradjuri, Barkandji and Yita Yita Nations hold a significant connection to the lands in which the Lachlan Regional Water Strategy falls upon.

The Lachlan region holds areas of great spiritual, cultural and economic importance to Aboriginal people and the NSW Government recognises the connection of the water to the people of these nations.

We recognise the intrinsic connection of Traditional Owners to Country and acknowledge their contribution to the management of the Lachlan Regional Water Strategy area landscape and natural resources.

NSW Department of Planning, Industry and Environment understands the need for consultation and inclusion of Traditional Owner knowledge, values and uses in water quality planning to ensure we are working towards equality in objectives and outcomes.

NSW Department of Planning, Industry and Environment is committed to continue future relationships and building strong partnerships with Aboriginal people. We thank the Elders, representatives of the Nari Nari, Ngiyampaa, Wiradjuri, Barkandji and Yita Yita Nations and Aboriginal community members who provided their knowledge throughout the regional water strategy development process.

Image courtesy of Paul Packard.

Options and government commitments for the Lachlan Regional Water Strategy

As outlined in the Draft Lachlan Regional Water Strategy, we have developed a long list of options and government commitments that could be included in the final strategy.

It is important to note that the options have not been prioritised and not all options have been costed.

In preparing this list, we recognise that a great deal of work has been done over the last few years to identify initiatives that could improve water management, water security and water reliability in the Lachlan region. We have collated options from previous studies and supplemented them with further options derived from recent experience, community engagement and current NSW Government initiatives and programs. Bringing all of these options together will also help to align and better sequence the various water reform processes underway to deliver the best outcomes for the Lachlan region.

These options aim to address the challenges the region may face in the future, while maximising opportunities arising from the growing agricultural sector, other emerging and expanding industries, and new investments in transport and community infrastructure.

The draft long list of options and government commitments focus on:

- maintaining and diversifying water supplies
- protecting and enhancing natural systems
- supporting water use efficiency and conservation
- strengthening community preparedness for climate extremes
- improving the recognition of Aboriginal people's water rights, interests and access to water.

Table 1 shows a snapshot of how we have matched the draft options and government commitments with these five categories and the challenges and opportunities we identified in the Draft Lachlan Regional Water Strategy.

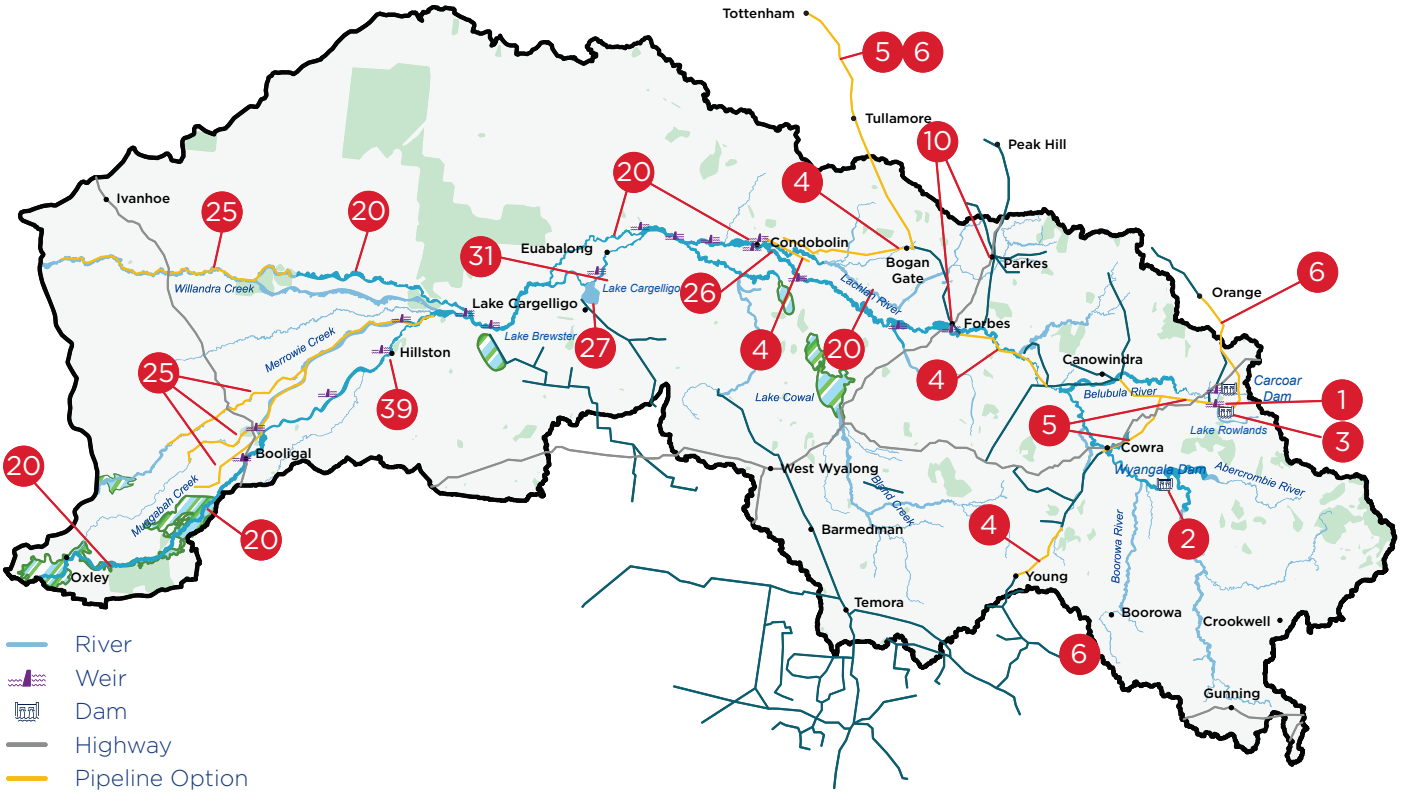
Overall, all options that are progressed will need to contribute to the liveability of the region.

Table 1. Draft long list of options and government commitments matrix

Category	Maintaining and diversifying water supplies	Protecting and enhancing natural systems
Region-specific challenges and opportunities	**Risks/Challenges:** • increased climate variability poses new risks to towns, communities and industries in the Lachlan • changing water needs, both within the agriculture industry and through strategic growth of regional centres • provide regional towns with multiple sources of supply. **Opportunities:** • improve town water security • maintain or improve water quality • support growth and industries in the region, and new development.	**Risks/Challenges:** • delivering water along a long river system • protecting native and threatened species in the Lachlan which are currently in poor health • increased climate variability will place increased pressure on surface and groundwater resources and the ecosystems they support • due to in-channel constraints, the ability to deliver water to these is reliant upon planned environmental water rules • treating drinking water that is contaminated by sediments, blue-green algae and heavy metals to the required health standards • regulation has reduced the frequency, depth and duration of watering events and connectivity for the majority of nationally significant floodplain wetlands and the landscape-scale functions they provide for waterbirds and native fish (such as breeding and recruitment) • natural drying and wetting cycles have been interrupted. **Opportunities:** • improve environmental water outcomes through active management of flows, improving riparian management and augmenting existing infrastructure • recognise wider community benefits that the natural environment provides.
Options and government commitments	• Water transfer pipeline between Lake Rowlands and Carcoar Dam • Wyangala Dam raising project • Lake Rowlands augmentation • Expansion to the piped town water supply system • Replacement and upgrade of existing pipelines • Inter-regional connections project investigation • Water quality treatment works • Managed aquifer recharge investigation and policy • Reuse, recycle and stormwater projects • Reliable access to groundwater by towns	• Cold water pollution mitigation measures • Environmental restoration works • Improved management of wetlands on private land • NSW Fish Passage Strategy • Active management of flows • Water quality restoration works • Floodplain management works • Diversion screens to prevent fish extraction at pump offtakes • River Ranger Program • Secure flows for water-dependent cultural sites • Improved understanding of groundwater processes • Sustainable access to groundwater • Improved clarity in managing groundwater resources sustainably

Supporting water use efficiency and conservation	Strengthening community preparedness for climate extremes	Improving the recognition of Aboriginal people's water rights, interests and access to water
Risks/Challenges: • delivering water along a long river system, and reducing evaporation losses • increased climate variability poses new risks to towns, communities and industries in the Lachlan. **Opportunities:** • improve water use • maintain/improve productivity/ efficiency in delivery • demand management (via price signals, policy and/or trade).	**Risks/Challenges:** • ensuring healthy water sources to support the region's environment, which—in turn—supports liveable communities and thriving industries • increased climate variability poses new risks to towns, communities and industries in the Lachlan • ensuring better flood management capabilities. **Opportunities:** • fit-for-purpose policies and regulation to protect town water security • strengthen community health and wellbeing • opportunities to better manage risks.	**Risks/Challenges:** • Aboriginal people's rights and obligations are not adequately recognised or provided for in current water laws and policies, and there are limited opportunities to influence management decisions • Aboriginal people have limited access to water allocations to use for cultural and economic purposes • Aboriginal knowledge and science are not effectively integrated into water management in culturally appropriate ways • lack of culturally appropriate information about how governments manage water. **Opportunities:** • protect and strengthen cultural landscapes, practices, knowledge and traditions • support the empowerment, self-determination and economic advancement of Aboriginal people • strengthen the community wellbeing of Aboriginal people.
• Water efficiency projects (towns and industries) • Lower Lachlan efficiency measures • Mid-Lachlan efficiency measures • Improvements to the storage effectiveness of Lake Cargelligo • Review of water trade in the Lachlan region • Water pricing pilot study • Urban water restriction policy • The 'Sheet of Water' storage	• Efficiency for drought security program • Drought operation rules • Review of water accounting and allocation process • Investigation of licence conversions • Improved data collection and storage • Training and information sharing programs: – new climate data/modelling – managing groundwater resources sustainably • Investigation to maintain amenity for regional towns during drought • In-stream storage for the Lower Lachlan • Land use change impact on water resources	• Culturally appropriate water knowledge program • Water-dependent cultural practice and site identification project • Shared benefit project (environment and cultural outcomes) • Aboriginal cultural water access licence review • Water portfolio project for Aboriginal communities • Co-management investigation for Travelling Stock Reserves • Regional Aboriginal water advisory committee • Regional Cultural Water Officer employment program

Lachlan long list of options and government commitments map



Options not shown on the map are not location specific.

Legend:

Maintaining and diversifying water supplies

1. Water transfer pipeline between Lake Rowlands and Carcoar Dam
2. Wyangala Dam raising project
3. Lake Rowlands augmentation
4. Expansion to the piped town water supply system
5. Replacement and upgrade of existing pipelines
6. Inter-regional connections project investigation
7. Water quality treatment works
8. Managed aquifer recharge investigation and policy
9. Reuse, recycle and stormwater projects
10. Reliable access to groundwater by towns

Protecting and enhancing natural systems

11. Cold water pollution mitigation measures
12. Environmental restoration works
13. Improved management of wetlands on private land
14. NSW Fish Passage Strategy
15. Active management of flows
16. Water quality restoration works
17. Floodplain management works
18. Diversion screens to prevent fish extraction at pump offtakes
19. River Ranger Program
20. Secure flows for water-dependent cultural sites
21. Improved understanding of groundwater processes
22. Sustainable access to groundwater
23. Increased clarity in managing groundwater resources sustainably

Supporting water use efficiency and conservation

24. Water efficiency projects (towns and industries)
25. Lower Lachlan efficiency measures
26. Mid-Lachlan efficiency measures
27. Improvements to the storage effectiveness of Lake Cargelligo
28. Review of water trade in the Lachlan region
29. Water pricing pilot study
30. Urban water restriction policy
31. The 'Sheet of Water" storage

Strengthening community preparedness for climate extremes

32. Efficiency for drought security program
33. Drought operation rules
34. Review of water accounting and allocation process
35. Investigation of licence conversions
36. Improved data collection and storage
37. Training and information sharing programs
    - new climate data/modelling
    - managing groundwater resources sustainably
38. Investigation to maintain amenity for regional towns during drought
39. In-stream storage for the Lower Lachlan
40. Land use change impact on water resources

Improving the recognition of Aboriginal people's water rights, interests and access to water

41. Culturally appropriate water knowledge program
42. Water-dependent cultural practice and site identification project
43. Shared benefit project (environment and cultural outcomes)
44. Aboriginal cultural water access licence review
45. Water portfolio project for Aboriginal communities
46. Co-management investigation of Travelling Stock Reserves
47. Regional Aboriginal water advisory committee
48. Regional cultural water officer employment program

Not all options in this long list will be progressed. Only feasible options will be progressed, following the evidence-based assessment process described in the *Regional Water Strategies Guide*. Each final package of options will also consider how the implementation of the preferred options should be staged.

This document describes each option and government commitment, its intent and the challenges it seeks to address. The option is aligned with one or more of the overarching objectives set for the NSW regional water strategies (see Figure 1). Additional considerations and further work required to progress the option are identified. This will need to be supplemented by further analysis and your feedback. Where possible, links and references are provided for further information.

The list also identifies potential combinations of options and government commitments. These combinations recognise that most options require associated works, further assessments and/or legislative, policy and planning changes to ensure they address the risks and challenges identified in the Lachlan region and do not have unintended impacts. Our aim is to develop a final strategy with a balanced package of options that delivers on all of these objectives.

Figure 1. NSW regional water strategies: objectives

Deliver and manage water for local communities

Improve water security, water quality and flood management for regional towns and communities.

Enable economic prosperity

Improve water access reliability for regional industries.

Recognise and protect Aboriginal water rights, interests and access to water

Including Aboriginal heritage assets.

Protect and enhance the environment

Improve the health and integrity of environmental systems and assets, including by improving water quality.

Affordability

Identify least cost policy and infrastructure options.

Lachlan: Long list of options and government commitments

Maintaining and diversifying water supplies

Opportunities to improve town water security, maintain suitable water quality and support growth and jobs in the region.

Government commitment 1: Water transfer pipeline between Lake Rowlands and Carcoar Dam

Source: WaterNSW is preparing a detailed business case for this project (funding from Snowy Hydro Legacy Fund)

Description	Detailed business case to construct a pipeline linking Central Tablelands Water's storage (Lake Rowlands with a capacity of 4.5 GL) and WaterNSW's Carcoar Dam (capacity of 35.8 GL).
Intent	Enable water transfer between Lake Rowlands and Carcoar Dam to improve water security and reliability for towns and water-dependent industries in the Belubula catchment. Transfers from Lake Rowlands to Carcoar Dam would occur when appropriate volumes are available.
Challenges addressed	• Increased climate variability poses new risks to towns, communities and industries in the region. • Changing water needs, both within the agriculture industry and through strategic growth of regional centres.
Potential combinations	This government commitment could be combined with Government commitment 3 (Lake Rowlands augmentation) and Option 4 (Extension of the piped water supply system).
Considerations	The project requires: • assessment of future management and operating options and the associated costs and benefits for the whole-of-life cost of the asset • assessment of the disruption to existing dam capacity and operations during construction • amendments to the current water sharing plan for the Belubula regulated river to give Central Tablelands Water access to water stored in Carcoar Dam • decision on how any benefits of the project (transferred and stored water from Lake Rowlands in Carcoar Dam) are shared between urban, environmental and industrial users in the Belubula catchment • assessment of the potential impacts on other licence holders who access water from Carcoar Dam and any other water user in the Belubula system • assessment of potential impacts on planned environmental water in the Belubula River, river flows and connectivity and impacts on native fish species including threatened fish species due to capturing of floods from Lake Rowlands • assessment of disturbance impacts to channel morphology and hydrology from pipe construction and operation (such as impacts on connectivity and in-channel habitat) • assessment of pump screening requirements at waterways and reservoirs • assessment of biosecurity risks if water is transferred between storages • assessment of potential impacts on the sustainable diversion limit • assessment of impacts on Aboriginal cultural heritage • assessment of possible employment/economic opportunities for Aboriginal people.
Objective	
Further information	www.waternsw.com.au/projects/regional-nsw/lake-rowlands-dam-to-carcoar-dam-pipeline

Government commitment 2: Wyangala Dam raising project

Source: The NSW Government has given a commitment to progress to a detailed business case for raising the dam. This project is state significant infrastructure and assessments are being fast-tracked through the Water Supply (Critical Needs) Act 2019

Description	Detailed business case development of raising Wyangala Dam wall by approximately 10 m and increasing the storage capacity of the dam by 650 GL. The project also requires raising of the dam's spillway and intake towers.
Intent	Increase the storage capacity of the dam to improve water security and reliability during drought, and flood management capability in the Lachlan region.
Challenges addressed	• Increased climate variability poses new risks to towns, communities and industries in the region. • Changing water needs, both within the agriculture industry and through strategic growth of regional centres. • Ensuring better flood management capabilities.
Potential combinations	This government commitment could be combined with Option 4 (Expansion to the piped town water supply system), Option 34 (Review of water accounting and allocation process) and Option 11 (Cold water pollution mitigation measures). Councils and local water utilities have suggested that town water security could be improved further through changes in the size of the outlet valve at Wyangala Dam and/or adding an outlet valve. While not specified in the NSW Government's commitment, these options should be considered as part of the detailed business case for the dam augmentation. Councils and local water utilities have also suggested a direct pipeline connection to Wyangala Dam's deep water storage for emergency town water supply.
Considerations	The project requires: • assessment of future management and operating options and the associated costs and benefits for the whole-of-life cost of the asset • assessment of disruption to existing dam capacity and operations during construction • assessment of cold water pollution impacts • assessment of broader riparian impacts due to possible flow modifications (changed operational regime) and possible impacts on connectivity • assessment of impacts on native fish, including threatened species, ecological communities and ecosystems • assessment of impacts on planned environmental water, including consideration of possible (environmental) offsets needed to meet Basin Plan requirements • assessment of mitigation measures required (such as biodiversity offsets, environmental flows and fish passages) • assessment of potential impacts on cultural heritage sites and cultural values. Some Aboriginal communities have raised concerns about this proposal impacting on the amount of water that flows to the end of the system • assessment of any reduced frequency and duration of bankfull and overbank flows in the Lower and Mid-Lachlan to assess impacts on downstream users • assessment (and/or decision) on how the potential benefits of the project should be shared between urban, environment and industrial water licence holders in the Lachlan. This may require amendments to the water sharing plan for the Lachlan regulated river, which would also require additional consideration of risk to the accreditation (or re-accreditation) of the Lachlan Surface Water Resource Plan • assessment of potential impacts on the sustainable diversion limit • assessment of potential impacts on floodplain industries • assessment of possible employment/economic opportunities for Aboriginal people • assessment of opportunities for high value agriculture in the Lachlan region. Note: • WaterNSW is leading the development of the business case for the Wyangala Dam raising project • the department received comments on the management of the Wyangala Dam during consultation on the water resource plan development.
Objective	
Further information	www.waternsw.com.au/projects/regional-nsw/wyangala-dam www.waternsw.com.au/projects/infrastructure-studies/20-year-infrastructure-options-study

Government commitment 3: Lake Rowlands augmentation

Source: Central Tablelands Water, Central NSW Joint Organisation, councils in the Lachlan region

Description	Investigation of the benefits to augment Lake Rowlands (for example, by increasing storage capacity from 4.5 GL to 8 GL) or construct a new dam downstream of Lake Rowlands (with varying capacity).
Intent	• Increase the storage capacity of Lake Rowlands (or a new storage downstream) to improve water security and reliability for towns and industries in the Belubula catchment. • Provide opportunity to expand Central Tablelands Water supply network within and beyond the Lachlan region.
Challenges addressed	• Increased climate variability poses new risks to towns, communities and industries in the region. • Changing water needs, both within the agriculture industry and through strategic growth of regional centres.
Potential combinations	This government commitment could be combined with Option 4 (Expansion to the piped town water supply system) or Option 6 (Inter-regional connections project investigation).
Considerations	The project requires: • assessment of potential impacts on the sustainable diversion limit • assessment of the interaction with the Lake Rowlands to Carcoar pipeline detailed business case development • assessment of project sequencing between the Lake Rowlands to Carcoar pipeline detailed business case development • assessment of broader riparian impacts due to possible flow modifications (changed operational regime) and possible impacts on connectivity • assessment of impacts on native fish including threatened species, ecological communities, ecosystems, flows and environmental water allocations as well as in-channel environment • assessment of biosecurity risks if water is transferred between storages • assessment of mitigation measures required (such as biodiversity offsets, environmental flows and fish passages) • assessment of impacts on planned environmental water, including consideration of possible (environmental) offsets needed to meet Basin Plan requirements • assessment of cold water pollution impacts • assessment of any reduced frequency and duration of bankfull and overbank flows to assess impacts on downstream users • assessment of any disruption to existing dam capacity and operations during construction • assessment of environmental impact (such as the impact of reduced spills on environmental assets and native fish including threatened species) • assessment of reduction in supplementary flows • assessment of pump screening required at waterways and reservoir • assessment of impacts on Aboriginal cultural heritage • assessment of possible employment/economic opportunities for Aboriginal people. Note: • the project may also offset required dam safety work at Lake Rowlands • adjacent land to Lake Rowlands is owned by Central Tablelands Water.
Objective	
Further information	**Central Tablelands Water:** www.ctw.nsw.gov.au

Option 4: Expansion to the piped town water supply system

Source: Central Tablelands Water, Central NSW Joint Organisation, Department of Planning, Industry and Environment—Utilities, targeted consultation with local councils

Description	A range of projects could fall under this option, including: • Option A: Bogan Gate to Condobolin pipeline—connecting Condobolin into the regional pipeline network • Option B: Gooloogong-Forbes-Parkes pipeline—this option has two components: – transfer of potable water via a pipeline between Forbes' Water Filtration Plant and Parkes Reservoir (bi-directional) – transfer of potable water via a pipeline between Parkes reservoir and Gooloogong Bores (bi-directional) • Option C: Young to Cowra bi-directional pipeline—an 81 km pipeline to transfer potable water between Cowra and Young and a connection between the Cowra town water supply system and the Goldenfields Water County Council system.
Intent	Increase connections between town water supply in the Lachlan region and provide towns with access to more than one water source.
Challenges addressed	• Increased climate variability poses new risks to towns, communities and industries in the region. • Changing water needs, both within the agricultural industry and through strategic growth of regional centres. • Provide regional towns with multiple sources of supply.
Potential combinations	This option could be combined with Option 5 (Replacement and upgrade of existing pipelines), Government commitment 3 (Lake Rowlands augmentation) or Government commitment 1 (Water transfer pipeline between Lake Rowlands and Carcoar Dam).
Considerations	The option requires: • a better understanding of the risks to town water supply—informed by regional water strategy modelling • assessment of whether access to additional groundwater is feasible as the system is already fully allocated • assessment if these options would lead to changes in the pumping capacity and volume extracted from a water source (such as assessment of any potential impacts on allocations, licensing and any water sharing plan requirements) • assessment of potential impacts on low flow regime • assessment of disturbance impacts to channel morphology and hydrology (such as impacts on connectivity) • assessment of impacts on native fish including threatened species • assessment of any required river operational changes and flow on impacts on the environment • assessment of pump screening requirements at waterways and reservoirs • assessment of biosecurity risks if water is transferred between storages • assessment of possible triggers of when options would be initiated • assessment of impacts on Aboriginal cultural heritage • assessment of possible employment/economic opportunities for Aboriginal people. Note: The department received extensive comments on town water security needs during consultation on the water resource plan development.
Objective	
Further information	**Centroc Water Security Study (2009): www.centroc.com.au/centrocs-advocacy-priorities/water-infrastructure/water-security-study/ and later work by the Central NSW Joint Organisation**

Image courtesy of Destination NSW.

Option 5: Replacement and upgrade of existing pipelines

Source: Central NSW Joint Organisation, Department of Planning, Industry and Environment—Utilities, targeted consultation with local councils

Description	A range of projects could fall under this option, including: • Option A: Replacement and upgrade of B-section pipeline (Parkes Shire boundary to Tottenham, Bogan Gate and Tullamore). This option would replace 43 km of pipeline to reduce water losses and improve water security for the village of Albert and town of Tottenham. A strategic upgrade to a subsection of the pipeline would allow additional water delivery to Tottenham, Bogan Gate and Tullamore • Option B: Cowra to Central Tablelands Water bi-directional pipeline. This option would include construction of 2-3 pump stations to enable water to be pumped in reverse from Cowra to Trunk Main C with the potential to put 3.5 ML/day back into the Central Tablelands system. With a pipeline upgrade to Trunk Main C from Canowindra to Carcoar, this would enable the distribution of additional water through the Central Tablelands system. The project would provide additional water security to Molong, Cumnock and Yeoval.
Intent	Increase the connections between town water supply in the Lachlan region and provide towns with access to more than one water source.
Challenges addressed	• Increased climate variability poses new risks to towns, communities and industries in the region. • Changing water needs, both within the agricultural industry and through strategic growth of regional centres. • Provide regional towns with multiple sources of supply.
Potential combinations	This option could be combined with Government commitment 1 (Water transfer pipeline between Lake Rowlands and Carcoar Dam) or Government commitment 3 (Lake Rowlands augmentation).
Considerations	The option requires: • a better understanding of the risks to town water supply—informed by regional water strategy modelling • assessment of possible triggers of when options would be initiated • further investigation of the policy implications of Option B • assessment of pump screening requirements at waterways and reservoirs • assessment if these options would lead to changes in the pumping capacity and volume extracted from a water source (such as assessment of any potential impacts on allocations, licensing and any water sharing plan requirements) • assessment of impacts on Aboriginal cultural heritage • assessment of possible employment/economic opportunities for Aboriginal people. Note: • asset replacement is the responsibility of the asset owner; however, options may be eligible for co-funding through the Safe and Secure Water Program • councils and local water utilities also raised opportunities to augment existing in-river gauges to improve town water security. No explicit example was suggested but possible impacts need to be assessed once specific projects are proposed • the department received extensive comments on town water security needs during consultation on the water resource plan development.
Objective	
Further information	**Details of Option 5A (replacement and upgrade of B-section pipeline):** **www.lachlan.nsw.gov.au/enviroment/water-sewer.aspx**

Option 6: Inter-regional connections project investigation

Source: Central NSW Joint Organisation, Department of Planning, Industry and Environment—Utilities

Description	Investigation of additional inter-regional pipeline connections between the Lachlan and neighbouring regions (Macquarie-Castlereagh and Murrumbidgee).
Intent	Increase the connections between town water supply systems and provide towns with access to more than one water source.
Challenges addressed	• Increased climate variability poses new risks to towns, communities and industries in the region. • Changing water needs, both within the agricultural industry and through strategic growth of regional centres. • Provide regional towns with multiple sources of supply.
Potential combinations	This option could be combined with Government commitment 1 (Water transfer pipeline between Lake Rowlands and Carcoar Dam) or Government commitment 3 (Lake Rowlands augmentation).
Considerations	The option requires: • assessment of whether this option would lead to changes in the pumping capacity and volume extracted from a water sources (such as assessment of any potential impacts on allocations, licensing and any water sharing plan requirements) • assessment of possible triggers or conditions when this option would be progressed • assessment of biosecurity risks if water is transferred between storages • assessment of pump screening requirement at waterways and reservoirs • analysis of public acceptance of the option. Note: • the likely benefit of this option will be informed by the hydrologic modelling in different catchments • conditions under which these inter-regional connections could operate would need to be assessed on a case-by-case basis • the department received extensive comments on town water security needs during consultation on the water resource plan development.
Objective	

Option 7: Water quality treatment works

Source: Central Tablelands Water, Central NSW Joint Organisation

Description	Investigation of necessary upgrades to existing infrastructure or construction to meet urban potable water requirements. Examples include the Blayney Well/Blue Hole water pre-treatment and associated pipeline project identified by Central Tablelands Water.
Intent	Increase individual town water security and quality in the Lachlan.
Challenges addressed	• Increased climate variability poses new risks to towns, communities and industries in the region. • Changing water needs, both within the agriculture industry and through strategic growth of regional centres. • Protect water quality for regional communities. • Provide regional communities with multiple sources of supply.
Potential combinations	This option could be combined with other options such as Option 5 (Replacement and upgrade of existing pipelines).
Considerations	Asset replacement is the responsibility of the asset owner; however, options may be eligible for co-funding through the Safe and Secure Water Program. Note: • options developed under this category would need to have a regional focus • the department received comments on water quality concerns in the Lachlan during consultation on the water resource plan development.
Objective	

Option 8: Managed aquifer recharge investigation and policy

Source: Department of Planning, Industry and Environment—Water, consultation with joint organisations and councils

Description	Investigation of possible sites for temporary storage of stormwater and river flows in aquifers to improve storage efficiencies. This is normally referred to as managed aquifer recharge. This option would develop a supporting policy to regulate the storage and recovery of this water.
Intent	More efficient use (by minimising evaporation) of water in areas where demand is high.
Challenges addressed	• Changing water needs, both within the agriculture industry and through strategic growth of regional centres. • Provide regional towns with multiple sources of supply.
Potential combinations	This option builds on Option 21 (Improved understanding of groundwater processes), Option 22 (Sustainable access to groundwater) and Option 23 (Improved clarity in managing groundwater resources sustainably). It could be combined with Option 10 (Reliable access to groundwater by towns).
Considerations	The option requires: • consideration of the distribution of benefits (such as additional water because of reduced evaporation) amongst consumptive water users and the environment • consideration of equity issues between irrigation and mining industries and cross-subsidies in implementing a managed aquifer recharge policy • an assessment of the engineering and economic challenges of managed aquifer recharge • an assessment of the licensing and accounting framework for surface water temporarily stored as groundwater • an assessment of public acceptance of this option (including specific pilot schemes) • an assessment of required policy and legislative changes • an assessment of biosecurity risks associated with transferring water from surface water to groundwater • assessment of pump screening requirements.
Objective	 

Option 9: Reuse, recycle and stormwater projects

Source: Department of Planning, Industry and Environment—Water

Description	Investigation of opportunities to maximise the use of surface water and groundwater for potable and non-potable uses through reuse/recycle initiatives or stormwater harvesting. Suitable options would need to be scoped; however, options could focus on improving the water security in individual towns, supporting the establishment of new industries and providing options to maintain 'green' spaces during extended drought.
Intent	Increase urban water security through a multi-source approach, improve water reliability for industries in the Lachlan region and maintain local parks, town water lakes and green spaces during droughts.
Challenges addressed	• Increased climate variability poses new risks to towns, communities and industries in the region. • Changing water needs, both within the agriculture industry and through strategic growth of regional centres. • Ensuring healthy water sources to support the region's environment, which—in turn—supports liveable communities and thriving industries.
Potential combinations	This option could be combined with other options such as Option 8 (Managed aquifer recharge investigation and policy) and Option 7 (Water quality treatment works).
Considerations	The option requires: • consultation with local councils and communities to understand the level of acceptance for these alternative water supply and reuse options. This particularly relates to the use of recycled wastewater • an assessment of how the options should interact with individual town integrated water cycle management strategies. For cases where there is no integrated water cycle management strategy, consultation is critical to understand the council and community appetite for such initiatives. There is also a need to consider: • whether changes to state-wide policy and regulation are required to support urban stormwater harvesting and use in urban centres for the needs identified • impact on users downstream of effluent and urban stormwater discharge points • state-wide whole of government policy and regulation on return flow credits. This option could be investigated as part of each council's integrated water cycle management strategy. Councils could seek co-funding under the Safe and Secure Water Program for preparing their integrated water cycle management strategies.
Objective	
Further information	**Parkes Water Recycle Scheme:** **www.parkes.nsw.gov.au/environment/water/recycled-water-scheme/** **Information on broad water sensitive city principles:** **www.watersensitivecities.org.au/what-is-a-water-sensitive-city/**

Option 10: Reliable access to groundwater by towns

Source: Department of Planning, Industry and Environment—Water, consultation with joint organisations and councils

Description	Strategic review and planning across the state to identify: • towns where future water demands could exceed the capacity of surface water resources (including the adaptive nature of river operations during drought conditions, such as rivers being cut off upstream of a given town) • likelihood and consequences of such exceedances (for example: is water carting feasible and economically sound?) • towns where future water demands could exceed current entitlements • groundwater resources that could be used as a complementary water supply (identified with field—and numerical modelling-based information) • regulatory issues potentially slowing or preventing access to these groundwater resources • what infrastructure investments (borefields and pipelines) are needed and their timing • impact of changing groundwater access on other users (such as domestic and stock and industry users). This option would improve processes and policies to address challenges faced by towns accessing groundwater during the current drought. This option would not replace the need for councils to have integrated water cycle management plans.
Intent	Support town water security by diversifying existing portfolios.
Challenges addressed	Changing water needs, both within the agriculture industry and through strategic growth of regional centres.
Potential combinations	This option builds on Option 21 (Improved understanding of groundwater processes), Option 22 (Sustainable access to groundwater), and Option 23 (Improved clarity in managing groundwater resources sustainably). It could be combined with Option 8 (Managed aquifer recharge investigation and policy) and Option 37 (Training and information sharing programs).
Considerations	This option requires an assessment of the roles and responsibilities of state versus local government.
Objective	

Image courtesy of Paul Packard.

Protecting and enhancing natural systems

Opportunities to protect and enhance environmental outcomes and realise broader community benefits through a healthy environment.

Option 11: Cold water pollution mitigation measures

Source: Department of Primary Industries—Fisheries, Department of Planning, Industry and Environment—Environment, Energy and Science

Description	Option to minimise cold water pollution impacts in the Lachlan regulated system. Wyangala Dam poses the highest risk of cold water pollution in the Lachlan and could be investigated first. Water releases from Wyangala Dam can decrease temperatures by 14°C or more in summer for up to around 170 km downstream of Wyangala Dam. This deteriorates riverine ecological functions, particularly in summer where biological cues such as fish spawning are disrupted. Cold water pollution also has social and tourism impacts, with recreational use of the Lachlan River downstream of Wyangala Dam (such as for swimming and fishing) constrained due to cold summertime water temperatures (15°C).
Intent	• Restore near natural river water temperature to provide native and threatened fish species in the Lachlan system with the necessary environmental cues and conditions to spawn, recruit, move and grow. • Provide opportunities for fish growth and other life cycle processes within over 170 km of high priority fish habitat in the Lachlan River. • Improve social amenity through access to recreational activities, which will have flow-on economic benefits for regional communities below Wyangala Dam.
Challenges addressed	Protecting native and threatened species in the Lachlan which are currently in poor health.
Considerations	The option requires: • detail on the business case development for Wyangala Dam to understand how and when this option could be incorporated • an assessment on how it will align with the Lachlan Long Term Water Plan and NSW Cold Water Pollution Strategy. Note: The department received comments on cold water pollution concerns during consultation on the water resource plan development.
Objective	
Further information	**Department of Primary Industries Fisheries—Cold Water Pollution explanation:** www.dpi.nsw.gov.au/fishing/habitat/threats/cold-water-pollution **Lachlan Long Term Water Plan:** www.environment.nsw.gov.au/topics/water/water-for-the-environment/planning-and-reporting/long-term-water-plans/lachlan

Option 12: Environmental restoration works

Source: Department of Primary Industries—Fisheries, Department of Planning, Industry and Environment—Environment, Energy and Science in consultation with local stakeholders

Description	Several possible components have been discussed between Department of Planning, Industry and Environment—Environment, Energy and Science and local stakeholders in the Lower Lachlan. These could include: • reconfiguration of regulating structures and weirs • removal of flow constraints (such as at Willandra Creek and Booberoi Creek) • rehabilitation of wetlands in the Lower Lachlan through works • augmentation of regulators or inlet channels to allow for improved water flow • strategic management of in-stream vegetation (ecological thinning).
Intent	Optimise the environmental benefits that can be achieved through environmental watering; improve the water quality, quantity and timing of environmental flows; remove barriers to improve flow efficiency and facilitate the efficient delivery of environmental flows to high value environmental sites.
Challenges addressed	• Protecting native and threatened species in the Lachlan which are currently in poor health. • Regulation has reduced the frequency, depth and duration of watering events and connectivity for the majority of nationally significant floodplain wetlands and the landscape-scale functions they provide for waterbirds and native fish (such as breeding and recruitment). • Natural drying and wetting cycles have been interrupted, and in some cases, have established ecosystems with newly recognised environmental, social and economic values. • Operational baseflows and timing, and other delivery constraints (outlet capacity, siltation, excessive vegetation growth in man-made delivery channels). • Impacts on water-dependent cultural areas.
Potential combinations	This option could be combined with Option 16 (Water quality restoration works), Option 18 (Diversion screens to prevent fish extraction at pump offtakes) or Option 13 (Improved management of wetlands on private land), as well as other options designed to strengthen community preparedness for climate extremes. Note: Many infrastructure proposals have a requirement to provide fish passage, biodiversity impact assessments and offsets for habitat loss under the *Fisheries Management Act 1994*; therefore, additional measures would be needed to mitigate impacts on the environment.
Considerations	The option requires: • alignment with the objectives of the Lachlan Long Term Water Plan • an assessment of impacts on other water users in the Lower Lachlan • an assessment of the outcomes from the *Independent Panel Assessment of the Management of the 2020 Northern Basin First Flush Event*. Note: The department received comments on environmental watering during consultation on the water resource plan development.
Objective	
Further information	**www.environment.nsw.gov.au/topics/water/water-for-the-environment/planning-and-reporting/long-term-water-plans/lachlan**

Option 13: Improved management of wetlands on private land

Source: Department of Primary Industries—Agriculture, Department of Planning, Industry and Environment—Environment, Energy and Science, Local Land Services

Description	Investigate opportunities to improve the management of wetlands located on private land. These sites are often used for grazing, which impacts native vegetation cover and reduces streambank stability, damages important in-stream habitat and reduces water quality. Options could include fencing off environmental sensitive areas from livestock or riparian rehabilitation.
Intent	Protect native vegetation (including in-stream habitat) on private wetlands. The option could also inform the implementation of a future grazing strategy to protect and restore wetland vegetation and lead to the development of incentive mechanisms for landholders to protect wetlands on private land.
Challenges addressed	• Regulation has reduced the frequency, depth and duration of watering events and connectivity for the majority of nationally significant floodplain wetlands and the landscape-scale functions they provide for waterbirds and native fish (such as breeding and recruitment). • Natural drying and wetting cycles have been interrupted, and in some cases, have established ecosystems with newly recognised environmental, social and economic values. • Operational baseflows and timing, and other delivery constraints (outlet capacity, siltation, excessive vegetation growth in man-made delivery channels). • Water quality impacts on water-dependent cultural areas, plants, animals and food sources.
Potential combinations	This option could be combined with options focused on protecting and enhancing natural systems such as Option 12 (Environmental restoration works) and options designed to strengthen community preparedness for climate extremes such as Option 36 (Improved data collection and storage).
Considerations	The option requires: • cooperation and partnerships with landholders to implement • an assessment of whether the option could be scaled and extended beyond private land.
Objective	
Further information	www.environment.nsw.gov.au/topics/water/water-for-the-environment/planning-and-reporting/long-term-water-plans/lachlan www.lls.nsw.gov.au/regions/central-west www.minister.agriculture.gov.au/littleproud/media-releases/%2415m-fencing-northern-basin

Option 14: NSW Fish Passage Strategy

Source: Department of Primary Industries—Fisheries

Description	Many native fish species in the Lachlan require unimpeded access through waterways to carry out natural reproductive and migratory processes. Physical waterway barriers such as weirs and dams can limit these processes leading to a decline in the health and viability of native fish populations. Currently native fish can only move through the Lachlan system during high flow conditions when water overflows weirs and other instream barriers. This option will look at a staged remediation of fish passages at 33 priority areas in the Lachlan catchment. This opening of fish passages would: • improve the ability of fish to move along waterways to access important habitat and food sources • improve the ability of fish to access reproductive and spawning grounds in the system. This strategy will be carried out over multiple phases. Phase 1 involves fishway construction at four sites, three of which are existing WaterNSW statutory requirements from the Wyangala Dam Safety Upgrade Project that will proceed in the next five years: Lake Brewster Diversion Weir, Booberoi Weir, Lake Cargelligo Outlet Regulator and Lake Cargelligo Inlet Regulator. Following the successful completion of Phase 1, the NSW Fish Passage Strategy recommends fishway construction at priority barriers that will improve NSW native fish access to 1,300 km of waterway.
Intent	• Maintain and improve native fish access to core habitat in the Lachlan valley while conserving environmental water entitlements. • Improve fish movement through fishways and encourage breeding and spawning activities, particularly for threatened species. • Improve recreational fishing and regional tourism opportunities.
Challenges addressed	Protecting native and threatened species in the Lachlan which are currently in poor health.
Potential combinations	This option could be combined with other options focused on protecting and enhancing natural systems such as Option 16 (Water quality restoration works or Option 18 (Diversion screens to prevent fish extraction at pump offtakes).
Considerations	This option requires alignment with the Lachlan Long Term Water Plan.
Objective	

Option 15: Active management of flows

Source: Department of Planning, Industry and Environment—Water

Description	Investigation to increase operational management in unregulated rivers. It involves determining what volumes of flows can be accessed at which times according to a set of defined rules.
Intent	Protect environmental water in unregulated systems from extraction by other users.
Challenges addressed	Increased climate variability, particularly during dry times, will place increased pressure on surface and groundwater resources and the ecosystems they support.
Potential combinations	This option could be combined with other options focused on protecting and enhancing natural systems such as Option 16 (Water quality restoration works), Option 14 (NSW Fish Passage Strategy) and Option 18 (Diversion screens to prevent fish extraction at pump offtakes).
Considerations	The option requires: • an assessment of the feasibility of this option in the Lachlan region • an assessment of necessary water sharing plan amendments • an assessment of the impact on other water users in the region • significant consultation with water users and environmental managers • an assessment of how the option would interact with the management of all environmental water in the region • an assessment of the impacts on groundwater (such as changes to groundwater discharge to unregulated rivers) • an assessment of the outcomes from the *Independent Panel Assessment of the Management of the 2020 Northern Basin First Flush Event*. Note: The department received comments on active management of flows during consultation on the water resource plan development.
Objective	
Further information	A similar option has been investigated in the Barwon Darling. Information on that project (for example, the concept, the impact on users, and the types of changes required to the water sharing plan) can be viewed at: **www.industry.nsw.gov.au/water/plans-programs/water-resource-plans/drafts/barwon-darling**

Option 16: Water quality restoration works

Source: Department of Primary Industries—Fisheries, Department of Planning, Industry and Environment—Water, Department of Planning, Industry and Environment—Environment, Energy and Science

Description	Investigate opportunities to support the water quality management plans that have been prepared for the Lachlan surface water and groundwater water resource plans.
Intent	Reduce the risks of blue-green algae outbreaks in the Lachlan, reduce upstream pollution impacts on waterways and reduce pest species (such as carp).
Challenges addressed	• Protecting native and threatened species in the Lachlan which are currently in poor health. • Treating drinking water that is contaminated by sediments, blue-green algae and heavy metals to the required health standards. • Protecting critical environmental assets and native and threatened species.
Potential combinations	This option could be combined with other options focused on protecting and enhancing natural systems such as Option 11 (Cold water pollution mitigation measures) and options designed to strengthen community preparedness for climate extremes such as Option 33 (Drought operation rules).
Considerations	Water quality management plans are yet to be finalised in the Lachlan. The effectiveness of these plans needs to be tested before this option is triggered. Note: • the Lachlan Surface Water Resource Plan has a water quality allowance • the department received comments on water quality during consultation on the water resource plan development.
Objective	
Further information	**Water quality management plan (surface water):** **www.mdba.gov.au/publications/mdba-reports/lachlan-water-resource-plan** **Water quality management plan (groundwater):** **www.industry.nsw.gov.au/water/plans-programs/water-resource-plans/drafts/lachlan-alluvium/components-for-consultation**

Option 17: Floodplain management works

Source: Department of Planning, Industry and Environment—Water

Description	A review of current floodplain works in the Lachlan region to assess if they pose a risk to achieving environmental and other water security outcomes in the region.
Intent	Protect the environment and improve water security outcomes by identifying risks posed by existing floodplain works.
Challenges addressed	• Increased climate variability, particularly during dry times, will place increased pressure on surface and groundwater resources and the ecosystems they support. • Protecting native and threatened species in the Lachlan which are currently in poor health.
Potential combinations	This option could be combined with other options focused on protecting and enhancing natural systems such as Option 11 (Cold water pollution mitigation measures) and options designed to strengthen community preparedness for climate extremes.
Considerations	The option requires: • an assessment of the potential costs of removing or modifying existing floodplain works • an assessment of the impacts on productivity and production capability for some industries and users • an assessment if there is merit in expanding the current floodplain management program and floodplain harvesting program to the Lachlan region. Note: The current floodplain management program and floodplain harvesting program is not being rolled out in the Lachlan valley.
Objective	
Further information	**Department of Planning, Industry and Environment—historic floodplain management plans: www.industry.nsw.gov.au/water/plans-programs/healthy-floodplains-project/plans/rural-fmp-under-part-8**

Option 18: Diversion screens to prevent fish extraction at pump offtakes

Source: Department of Primary Industries—Fisheries, Local Land Services

Description	This option will require the installation of screens on pumps and diversion channels to reduce the amount of fish being extracted at pump sites. Every year, native fish are extracted by pumps and diverted into irrigation channels, never to return to the Lachlan system (there are over 300 pump offtakes with a diameter greater than 200 ML in the Lachlan valley). Installation of screens at pump sites and diversion regulators will retain native fish within the region's waterways by preventing entrainment of adults, larvae and eggs. Screening infrastructure also improves water delivery and extraction efficiency due to reduced debris blockages, resulting in associated on-farm cost savings.
Intent	Significantly reduce the loss of native fish (adults, larvae and eggs) from waterways, while improving water delivery and extraction efficiency to achieve on-farm cost savings.
Challenges addressed	Protecting native and threatened species in the Lachlan which are currently in poor health.
Potential combinations	This option could be combined with other options focused on 'protecting and enhancing natural systems'.
Considerations	The option requires: • Local Land Services Central West has recently completed an expression of interest process for a Fish Friendly Screens Pilot Project in the Lachlan and Macquarie rivers. This pilot project will verify program cost-benefits, including environment outputs, water delivery efficiency and long-term social and financial implications for water licence holders • an assessment of incentive schemes for landholders to install screens. Note: Diversion screens have been used successfully for decades overseas (for example, in western USA, Europe and New Zealand).
Objective	
Further information	**Local Land Services Central West Fish Friendly Screens Pilot Project:** **www.lls.nsw.gov.au/regions/central-west**

Option 19: River Ranger Program

Source: Department of Planning, Industry and Environment—Water, Aboriginal consultation

Description	Investigate options for the establishment of an Aboriginal River Ranger Program to assist in maintaining the health and management of rivers and wetlands throughout the Lachlan region. This role may be involved in: • pest management (fish and weeds) • remediation and mitigation of impacts on waterways including riparian zones • restocking native fish and vegetation species • working closely with compliance officers • protecting and managing riparian zones along waterways • involvement in monitoring, evaluation and research programs run by government.
Intent	• Improve the involvement of local Aboriginal people in the management and protection of waterways and water-dependent cultural sites, including future generations. • Enable a closer relationship with environmental water managers across NSW. • Use local and traditional knowledge to improve water management outcomes, in a way that is culturally appropriate and respects cultural knowledge and intellectual property.
Challenges addressed	• Aboriginal people's rights and interests are not adequately recognised in current water laws, policies and management decisions. • Aboriginal people have limited access to water allocations to use for cultural and economic purposes. • Aboriginal knowledge and science are not effectively integrated into water management in culturally appropriate ways.
Potential combinations	This could be combined with other options such as Option 48 (Regional Cultural Water Officer employment program), Option 47 (Regional Aboriginal Water Advisory Committee) and Option 41 (Culturally appropriate water knowledge program).
Considerations	Similar programs could provide partnerships and learnings: • Indigenous Land Use Agreement land and waterway managers • Barkindji River Ranger Program—being developed under the Indigenous Land Use Agreement program with adaptive framework to better reflect a whole-of-catchment health approach • Local Land Services existing river management program • council pest species managers. Note: This option could be considered at a state level through a state-wide Aboriginal water policy. Considerations will also be given to the interactions between this option and the recent funding commitment made by the Australian Government to create four new Indigenous Ranger groups across the Murray-Darling Basin.
Objective	

Option 20: Secure flows for water-dependent cultural sites

Source: Department of Planning, Industry and Environment—Water, Aboriginal consultation

Description	Aboriginal people have a close spiritual connection with waterways. In the Lachlan catchment, many water-dependent cultural sites (including places of spiritual significance, and places of traditional hunting, recreation and cultural uses) are susceptible to dry conditions and the impacts of current water use by licence holders. Communities are deeply affected during dry periods and drought due to the reduction in their ability to access water for cultural purposes. This option would consider options for providing regular flows to culturally important sites in the Lachlan region, such as: • Murie Lake, located at The Murie Reserve, a former settlement near Condobolin • Euabalong Lagoons • Goobang Creek • Lake Waljeers • Ita Lake • Pimpara Creek • Willandra Lakes.
Intent	• Improve recognition of cultural sites and their protection and management. • Improve community wellbeing and connection to Country. • Ensure cultural sites are appropriately considered and supported in the Lachlan water management system.
Challenges addressed	• Aboriginal people's rights and interests are not adequately recognised in current water laws, policies and management decisions. • Aboriginal people have limited access to water allocations to use for cultural and economic purposes. • Aboriginal knowledge and science are not effectively integrated into water management in culturally appropriate ways.
Potential combinations	This could be combined with Option 42 (Water-dependent cultural practices and site identification project), Option 48 (Regional Cultural Water Officer employment program), Option 19 (River Ranger Program) and Option 47 (Regional Aboriginal Water Advisory Committee).
Considerations	This option would need to consider: • where water would be sourced from • how water would be delivered and whether new infrastructure is needed to deliver water to these sites • work undertaken as part of the water-dependent cultural practice and site identification option • protecting groundwater discharges to springs and streams • use of planned and held environmental water • how this option could be resourced.
Objective	

Option 21: Improved understanding of groundwater processes

Source: Interviews with staff across all functions of Department of Planning, Industry and Environment—Water, consultation with joint organisations and councils

Description	Groundwater management decisions are made using the best available information. Our understanding needs to continually improve based on the latest science. This option would progress the scientific understanding of five key groundwater processes: • recharge rates and their spatial-temporal variations, including the impacts from climate variation/change, on-and off-farm water efficiency projects, and adapting river operations • dynamics of groundwater levels under evolving development conditions (such as the shift from seasonal crops to permanent plantings) • connectivity between groundwater and surface water systems • changing patterns in groundwater quality over time • water needs of ecosystems that are partly or wholly dependent on groundwater and the impact on those under different development scenarios. This would consider what ecosystems need in terms of groundwater levels or baseflows from aquifers to river systems. This option would be delivered in collaboration with consultancies and research centres. A combination of desktop studies, field studies and numerical models would be used. The outcomes from the option would provide the scientific evidence-base for future groundwater management decisions.
Intent	Increase scientific knowledge of the processes occurring in NSW's groundwater resources, from areas of recharge to areas of discharge and the complex interactions in-between.
Challenges addressed	• Sustainable access to groundwater resources by all water users. • Increased climate variability will place increased pressure on surface and groundwater resources and the ecosystems they support.
Potential combinations	This option would build on Option 36 (Improved data collection and storage). It provides the basis for Option 22 (Sustainable access to groundwater) and Option 23 (Improved clarity in managing groundwater resources sustainably).
Considerations	This option requires an assessment of how it could be implemented given the time required for scientific studies and the timing of the revision/replacement of water sharing plans across the state.
Objective	

Option 22: Sustainable access to groundwater

Source: Interviews with staff across all functions of Department of Planning, Industry and Environment—Water, consultation with joint organisations and councils

Description	Groundwater extraction limits balance environmental and economic-social benefits and impacts. This option would establish a systematic state-wide process to ensure ongoing access to groundwater resources by the environment, landholders, towns, agriculture, mining and other industries. It would review existing groundwater resource extraction limits to incorporate up-to-date information, including: • scientific studies that incorporate new climate variation/change datasets to give an improved understanding of groundwater processes • insights into ways to improve the integration of surface water and groundwater management • knowledge about social and economic impacts under different development scenarios.
Intent	This option would consider what groundwater resource extraction limits would need to be set in the future to ensure sustainable access to groundwater by both consumptive water users and the environment.
Challenges addressed	Sustainable access to groundwater resources by all water users.
Potential combinations	This option would apply the outcomes from Option 21 (Improved understanding of groundwater processes). It provides the basis for Option 23 (Improved clarity in managing groundwater resources sustainably).
Considerations	This option would need to consider: • required policy or regulatory changes • commitments made under the Basin Plan 2012 and the mandatory review of Sustainable Diversion Limits in 2026.
Objective	

Option 23: Improved clarity in managing groundwater sustainably

Source: Department of Planning, Industry and Environment—Water, consultation with joint organisations and councils

Description	This option would review, revise and develop the necessary policies to give greater clarity in managing: • extraction within Sustainable Diversion Limits. This project would require a review of account rules and the annual groundwater allocation process. It would make assessment process for Available Water Determinations more formulaic and transparent • groundwater systems where the entitlements (plus basic rights) exceed the extraction limit. This project would look at ways to better manage those systems where the entitlement exceeds the resource extraction limit, particularly those systems where extraction is currently or will likely exceed the extraction limit. It would give clarity to water users about how these groundwater systems will be managed as activation and use increases over the next 30 years • areas of concentrated extraction (for example, where groundwater extraction is causing declines in water levels in some areas to unacceptable levels). This project would develop a policy with a series of escalating management actions corresponding to stages of water level decline. It would provide certainty to all water users about what actions government will take and when.
Intent	Within a framework of sustainable access to groundwater by all users, this option would provide greater transparency and certainty to water users about actions the NSW Government will take to manage groundwater resources at the water source and at local scales.
Challenges addressed	Sustainable access to groundwater resources by all water users.
Potential combinations	This option would apply the outcomes from Option 21 (Improved understanding of groundwater processes) and Option 22 (Sustainable access to groundwater).
Considerations	This option requires an assessment of how it could be implemented given the time required for scientific studies and the timing of the revision/replacement of water sharing plans across the state.
Objective	

Image courtesy of Destination NSW.

Supporting water use efficiency and conservation

Opportunities to improve the efficiency of existing water delivery systems, increase productivity and address water security challenges through demand management options.

Option 24: Water efficiency projects (towns and industries)	
Source: Department of Planning, Industry and Environment—Water	
Description	Investigation of water efficiency opportunities that can be deployed in regional communities and within businesses. This option may also require further research and development to identify suitable case studies (including for the food processing sector).
Intent	Improve water security for regional communities and encourage water efficiency measures for industries to maintain and drive regional economic growth and productivity.
Challenges addressed	• Increased climate variability poses new risks to towns, communities and industries in the Lachlan. • Changing water needs, both within the agriculture industry and through strategic growth of regional centres. • Increased climate variability will place increased pressure on surface and groundwater resources and the ecosystems they support.
Potential combinations	This option could be combined with other options designed to maintain and diversify water supplies, including Option 9 (Reuse, recycle and stormwater projects).
Considerations	The option requires: • an assessment of acceptance of regional communities for town water efficiency options • an assessment of viable opportunities in the regions • an assessment of the distribution of the benefits (including assessment of how the water savings could be shared between water users). Note: Some industries, including mining operations, are already reusing and recycling water.
Objective	

Option 25: Lower Lachlan efficiency measures

Source: WaterNSW

Description	Construction of a piped scheme to more efficiently deliver water to landholders (including stock and domestic users) along the Muggabah, Merrimajeel, Merrowie, Booberoi and Willandra Creeks. The option includes the construction of infrastructure and the development of groundwater resources to supplement demand.
Intent	Provide an alternative water supply to stock and domestic users in the Lower Lachlan, improve water delivery in effluent creeks and reduce transmission losses associated with otherwise replenishment flows in the effluent creeks.
Challenges addressed	• Delivering water along a long river system. • Increased climate variability poses new risks to towns, communities and industries in the Lachlan.
Potential combinations	This option could be combined with other options designed to strengthen community preparedness for climate extremes such as Option 34 (Review of water accounting and allocation process).
Considerations	The option requires: • an assessment of cultural impacts • an assessment of potential environmental impacts (such as impacts on base and fresh flows and associated impacts on threatened species and ecological communities in the Lower Lachlan and against the Lachlan Long Term Water Plan objectives and targets). Booberoi Creek in particular has considerable environmental and cultural assets, including a known population of threatened eel-tailed catfish • an assessment of whether amendments to water sharing plan are required to offset environment impacts • an assessment of groundwater impacts associated with the project (for example, additional groundwater might not be available to supplement demand) • an assessment of downstream impacts, including on the Murrumbidgee system • an analysis of public acceptance of the option. Note: This option has been considered as part of the WaterNSW's *Lachlan Valley Priority Catchment Water Security Study*. Since the development of the study, the NSW Government has invested in more detailed and sophisticated data and modelling methods. In particular: • climate modelling—we are using additional data to better understand climate risks and assess the potential costs and benefits of new infrastructure, policy and operational options • environmental water—we have improved how we represent held and planned environmental water in our modelling. As a result, the benefits of this option may change when assessed against the updated models.
Objective	
Further information	**WaterNSW's *Lachlan Valley Priority Catchment Water Security Study*:** **www.waternsw.com.au/projects/infrastructure-studies/belubula** **20-year infrastructure study:** **www.waternsw.com.au/projects/infrastructure-studies/20-year-infrastructure-options-study**

Option 26: Mid-Lachlan efficiency measures

Source: WaterNSW

Description	Construction of a piped scheme to more efficiently deliver water to landholders (including stock and domestic users) along the Wallamundry, Nerrathong and Wallaroi Creeks. The option includes the construction of infrastructure and the development of groundwater resources to supplement demand.
Intent	Provide an alternative water supply for stock and domestic users in the Mid-Lachlan, improve water delivery in effluent creeks and reduce transmission losses associated by closing inefficient creeks.
Challenges addressed	• Delivering water along a long river system. • Increased climate variability poses new risks to towns, communities and industries in the Lachlan.
Potential combinations	This option could be combined with other options designed to strengthen community preparedness for climate extremes such as Option 34 (Review of water accounting and allocation process) and options to protect and enhance natural systems.
Considerations	The option requires: • an assessment of potential environmental impacts (such as impact on base and fresh flows and associated impacts on threatened species and ecological communities in the Mid-Lachlan and against the Lachlan Long Term Water Plan objectives and targets) • an assessment of pump screening requirements at waterways and reservoir assessment of whether amendments to water sharing plan are required to offset environment impacts • an assessment of groundwater impacts associated with the project (for example, additional groundwater might not be available to supplement demand) • an analysis of public acceptance of the option. Note: An augmented Mid-Lachlan efficiency measure option has been noted in WaterNSW's 20-year infrastructure options study.
Objective	 
Further information	www.waternsw.com.au/projects/infrastructure-studies/belubula www.waternsw.com.au/projects/infrastructure-studies/20-year-infrastructure-options-study

Option 27: Improvements to the storage effectiveness of Lake Cargelligo

Source: WaterNSW

Description	Separation of the main lake at Cargelligo into three lakes.
Intent	• Reduce evaporation losses and improve the operational effectiveness of Lake Cargelligo. • Improve river operations and water security for towns, communities and industries.
Challenges addressed	• Delivering water along a long river system. • Increased climate variability poses new risks to towns, communities and industries in the Lachlan.
Potential combinations	This option could be combined with options designed to protect and enhance natural systems such as Option 12 (Environmental restoration works), Option 18 (Diversion screens to prevent fish extraction at pump offtakes) and other measures. Note that many infrastructure proposals have a requirement to provide fish passages biodiversity impact assessments and offsets for habitat loss under the *Fisheries Management Act 1994*; therefore, additional measures would be needed to mitigate impacts on the environment.
Considerations	The option requires: • an assessment of environmental impacts due to changed storage configuration along with any associated changes to the operational regime of the lakes and river system on environmental flows and environmental allocations • an assessment against the Lachlan Long Term Water Plan objectives and targets • an assessment of cultural impacts • an assessment of potential impacts on recreation users of the lake • an analysis of public acceptance of the option • an assessment of the impacts on connectivity, riparian conditions and native fish—including threatened species • an assessment of whether any fish passage would need to be constructed. Note: This option has been considered as part of the WaterNSW's *Lachlan Valley Priority Catchment Water Security Study*. Since the development of the study, the NSW Government has invested in more detailed and sophisticated data and modelling methods. In particular: • climate modelling—we are using additional data to better understand climate risks and assess the potential costs and benefits of new infrastructure, policy and operational options • environmental water—we have improved how we represent held and planned environmental water in our modelling. As a result, the benefits of this option may change when assessed against the updated models.
Objective	
Further information	**WaterNSW's *Lachlan Valley Priority Catchment Water Security Study*:** **www.waternsw.com.au/projects/infrastructure-studies/belubula** **20-year infrastructure option study:** **www.waternsw.com.au/projects/infrastructure-studies/20-year-infrastructure-options-study**

Option 28: Review of water trade in the Lachlan region

Source: Department of Primary Industries—Agriculture, Department of Planning, Industry and Environment—Water

Description	A review of the efficiency and effectiveness of the surface water and groundwater markets in the Lachlan.
Intent	• Provide transparency and confidence to water users in the Lachlan. • Educate water users about the operation of and rules governing the water trade in the Lachlan.
Challenges addressed	• Delivering water along a long river system. • Increased climate variability poses new risks to towns, communities and industries in the Lachlan.
Potential combinations	Depending on the outcome of the review, this option could be combined with other options that support water use efficiency and conservation.
Considerations	• The review would need to take account of previous work that was completed as part of the Lachlan Surface Water Resource Plan. • The review could be aligned/coordinated with the current Australian Competition and Consumer Commission inquiry into the Murray-Darling Basin water markets. The Australian Competition and Consumer Commission inquiry seeks to recommend options that would enhance the operations, transparency, regulation and competitiveness and efficiency of the water market in the Murray-Darling Basin. Note: The department received several comments on trade arrangements in the Lachlan region during consultation on the water resource plan development.
Objective	
Further information	**Australian Competition and Consumer Commission inquiry into the Murray-Darling Basin Water Market:** **www.accc.gov.au/focus-areas/inquiries-ongoing/murray-darling-basin-water-markets-inquiry**

Image courtesy of Destination NSW.

Option 29: Water pricing pilot study

Source: Department of Planning, Industry and Environment—Water, consultation with joint organisations and councils

Description	The Independent Pricing and Regulatory Tribunal sets maximum charges for water management services that the department delivers on behalf of the Water Administration Ministerial Corporation and for WaterNSW's rural bulk water services. The option consists of a pilot study that assesses: • how the evidence gathered through the Lachlan Regional Water Strategy could assist in future rural water charge determinations in the region, including how it could assist in Lachlan-specific customer shares • implications of the new climate data and modelling on future water charges in the Lachlan region, including the merits in moving to a different fixed to variable tariff ratio (for regulated, unregulated and groundwater charges) and impacts on the determination of future high security premiums • whether there are any gaps or discrepancies in water charges for groundwater and surface water when there is a high level of connectivity between water sources.
Intent	Ensure the evidence and climate data gathered though the regional water strategies can support future price determinations in regional NSW.
Challenges addressed	Increased climate variability poses new risks to towns, communities and industries in the Lachlan.
Potential combinations	This option could be linked to options that strengthen community preparedness for climate extremes such as Option 34 (Review of water accounting and allocation process).
Considerations	The option requires: • detailed engagement with the Independent Pricing and Regulatory Tribunal and the Australian Competition and Consumer Commission on the outcomes of the regional water strategy modelling and development of the pilot study • assessment of the benefits and risks involved in changing the current rural water charge framework • assessment of any current or upcoming reviews which may align with this pilot study. Note: For the Water Administration Ministerial Corporation, the Independent Pricing and Regulatory Tribunal sets maximum charges for water management charges, consent transaction charges and water take measurement charges. For WaterNSW, the Independent Pricing and Regulatory Tribunal sets maximum charges under two distinct legislative and regulatory frameworks: • Within the NSW Murray-Darling Basin regions—including the Lachlan—the Independent Pricing and Regulatory Tribunal determines maximum charges under the Water Charge (Infrastructure) Rules 2010. • Outside the NSW Murray-Darling Basin regions, the Independent Pricing and Regulatory Tribunal determines maximum charges under section 11 of the Independent Pricing and Regulatory Tribunal Act 1992. The Independent Pricing and Regulatory Tribunal has also recently completed a review of rural cost shares which considered the sharing of efficient costs of WaterNSW rural bulk water services and Water Administration Ministerial Corporation services between customers and the NSW Government.
Objective	
Further information	**Independent Pricing and Regulatory Tribunal:** www.ipart.nsw.gov.au/Home/Industries/Water/Reviews

Option 30: Urban water restriction policy

Source: Department of Planning, Industry and Environment—Water

Description	Development of a comprehensive policy on water use standards and appropriate water restriction levels for regional towns. The investigation would complement the Lachlan Incident Response Guide and assist councils and local water utilities to revise drought management plans.
Intent	Investigate a range of options to improve the consistency of temporary urban water restrictions in NSW. The work would also look at how the policy could assist local water utilities manage water supply shortages during drought by slowing the depletion of available supplies.
Challenges addressed	• Delivering water along a long river system. • Increased climate variability poses new risks to towns, communities and industries in the Lachlan.
Potential combinations	This option could be combined with other options designed to strengthen community preparedness for climate extremes such as option 34 (Review of water accounting and allocation process) and options designed to support water use efficiency and conservation such as Option 24 (Water efficiency projects (towns and industries)).
Considerations	Applying temporary urban water restrictions for residents and commercial operators in regional NSW is the responsibility of the state's 92 local water utilities. This has resulted in state-wide inconsistencies in: • water restriction definitions and gradings • triggers for introducing and lifting of urban water restrictions • the delegated authority for imposing and lifting urban water restrictions. This option would need to consider: • basic landholder rights • feasibility of implementation and governance arrangements • direct link and appropriate communication between state water managers and local councils/local water utilities. Note: The level of water restrictions has a direct impact on economic outputs, productivity and employment in the region. In the large regulated systems, the volume of water taken by towns may be very small, and introducing restrictions may provide minimal benefits to the overall system reliability.
Objective	

Option 31: The 'Sheet of Water' storage

Source: WaterNSW

Description	The 'Sheet of Water' is a natural lake upstream of Lake Cargelligo. Together with Lake Curlew and Lake Cargelligo, the three lakes form a connected system. The project would decommission the 'Sheet of Water' storage and construct a bypass channel.
Intent	Reduce evaporation losses associated with Lake Cargelligo and improve delivery efficiency throughout the Lower Lachlan.
Challenges addressed	• Delivering water along a long river system. • Increased climate variability poses new risks to towns, communities and industries in the Lachlan.
Potential combinations	This option could be combined with options designed to protect and enhance natural systems such as Option 12 (Environmental restoration works), Option 18 (Diversion screens to prevent fish extraction at pump offtakes) and other measures. Note: Many infrastructure proposals have a requirement to provide fish passage, biodiversity impact assessments and offsets for habitat loss under the *Fisheries Management Act 1994*; therefore, additional measures would be needed to mitigate impacts on the environment.
Considerations	Limited information is available on the option and its potential impact. However, as Lake Cargelligo (and associated lakes) are important environmental assets, detailed investigation of the potential impacts of this option need to be investigated (for example, the changed flow regime from decommissioning the storage and constructing the bypass channel and the value of the natural lake system). In addition, this option would require an assessment against the Lachlan Long Term Water Plan objectives and targets.
Objective	
Further information	**WaterNSW 20-year infrastructure strategy:** **www.waternsw.com.au/projects/infrastructure-studies/20-year-infrastructure-options-study**

Image courtesy of Destination NSW.

Strengthening community preparedness for climate extremes

Opportunities to develop fit-for-purpose policies and regulation to protect town water security, strengthen community health and wellbeing and better manage risks.

Option 32: Efficiency for drought security program

Source: Department of Planning, Industry and Environment—Water

Description	Investigate opportunities for water efficiency investment in the Lachlan region where the water savings could be shared between industry and regional communities. Governments' water efficiency investment in the Lachlan has been limited due to the earlier water entitlement purchases by the Australian Government under the Basin Plan.
Intent	Improve water security for regional communities and increase the productivity and resilience of water-dependent industries in the region.
Challenges addressed	• Ensuring healthy water sources to support the region's environment, which—in turn—supports liveable communities and thriving industries. • Increased climate variability poses new risks to towns, communities and industries in the Lachlan.
Potential combinations	This option could be combined with other non-infrastructure options designed to strengthen community preparedness for climate extremes such as Option 34 (Review of water accounting and allocation process), as well as options that maintain and diversify water supplies such as Government commitment 2 (Wyangala Dam raising project) and Option 4 (Expansion to the piped town water supply system).
Considerations	The option requires: • a detailed investigation to understand the merit and costs of this option, how it could be implemented, and any regulatory and operational changes this may need • further assessment of the distribution of the benefits of the program, as well as any required water sharing plan amendments that would need to be undertaken • assessment will be needed of interest from regional industries in such projects.
Objective	

Option 33: Drought operation rules

Source: Department of Planning, Industry and Environment—Water

Description	The Lachlan Incident Response Guide outlines the framework for managing extreme events in the Lachlan based on the principles outlined in the 'NSW Extreme Events Policy'. This guide provides an expanding toolkit of approaches for water managers to select from as an event becomes more severe. Applying the new climate data and updated modelling undertaken for the regional water strategies, this option would review the effectiveness of the Lachlan Incident Response Guide, including assessing the merit of changing the current system operation rules (for example, limiting the delivery of water to different sections of the regulated river) to minimise delivery losses during extreme events.
Intent	Improve water delivery and maintain effective reserves for high priority needs during extreme events.
Challenges addressed	• Ensuring healthy water sources to support the region's environment, which—in turn—supports liveable communities and thriving industries. • Increased climate variability poses new risks to towns, communities and industries in the Lachlan.
Potential combinations	This option could be combined with other non-infrastructure options designed to strengthen community preparedness for climate extremes such as Option 34 (Review of water accounting and allocation process), as well as Government commitment 2 (Wyangala Dam raising project) and Option 4 (Expansion to the piped town water supply system).
Considerations	The option requires: • an assessment of the potential water security risk to regional towns and stock and domestic users in the Lower Lachlan • an assessment of potential environmental impacts (such as impacts on threatened species and ecological communities) and the implications of changes on planned environmental water (for example, changing the timing of water release could have implications on threatened species populations in the Lachlan region) • consideration of possible (environmental) offsets needed to meet Basin Plan requirements • consideration of whether amendments to the current water sharing plan for the Lachlan regulated river are required • an assessment of the impacts on water licence holders in the Lower Lachlan • equity considerations between different users in different locations • compliance with requirements of the *Water Management Act 2000* • stakeholder feedback on the acceptance of this option • improved communication and engagement with local councils and local water utilities about drought protocols in the Lachlan region. Note: • further work is required (for example, separating specific components) to fully understand and assess risks to all water users in the Lachlan region • the department received several comments (contrary views) on the Lachlan Incident Response Guide and provision of critical human water needs during consultation on the water resource plan development.
Objective	
Further information	**Extreme Events Policy:** **www.industry.nsw.gov.au/water/what-we-do/legislation-policies/eep** **Incident Response Guide for the Lachlan:** **www.mdba.gov.au/publications/mdba-reports/lachlan-water-resource-plan**

Option 34: Review of water accounting and allocation process

Source: Department of Planning, Industry and Environment—Water, WaterNSW

Description	The option would review several settings of the current surface water accounting and water allocation process in the Lachlan regulated system, including: • a review of the water allocation process • the effects of updating the 'worst inflow sequence' reference in the water sharing plan for the Lachlan regulated river (for example, to incorporate climate change considerations) • investigate changes to a more conservative water allocation process to ensure more water is kept in storage for high priority needs • investigate how conveyance 'losses' are accounted for • investigate the inclusion of provisions for cultural flows.
Intent	Enable a longer planning horizon and ensure high priority water needs can be met in extended drought periods.
Challenges addressed	• Increased climate variability will place increased pressure on surface and groundwater resources and the ecosystems they support. • Increased climate variability poses new risks to towns, communities and industries in the Lachlan.
Potential combinations	This option could potentially be combined with other options designed to maintain and diversify water supplies.
Considerations	The option requires: • considering the likely benefits or impacts of any changes (including any accounting or operational changes to the delivery of water) on key environmental processes and cultural values • particular consideration given to the implications on planned environmental water (such as timing and ability to release), as well as associated implications for threatened species populations in the Lachlan valley and meeting the water requirements to protect and improve these populations • a review of previous work that was completed as part of the Lachlan Surface Water Resource Plan • compliance with requirements of the *Water Management Act 2000*. Note: The department received several comments on the existing water accounting and allocation process during consultation the water resource plan development.
Objective	
Further information	www.industry.nsw.gov.au/water/allocations-availability/allocations/how-water-is-allocated www.industry.nsw.gov.au/water/allocations-availability/water-accounting/gpwar

Option 35: Investigation of licence conversions

Source: Department of Planning, Industry and Environment—Water, targeted consultation with councils

Description	Consider the potential benefits from voluntary conversion of general security licences to high security licences.
Intent	• Investigate the level of water security achievable in the Lachlan region. • Give water users more flexibility in production, including long-term transition to higher value enterprises that require high security water.
Challenges addressed	• Changing water needs, both within the agriculture industry and through strategic growth of regional centres. • Increased climate variability poses new risks to towns, communities and industries in the Lachlan.
Potential combinations	This option could be combined with Government commitment 2 (Wyangala Dam raising project).
Considerations	The option requires: • detailed consideration of current policy, regulatory, water management constraints and risks to other water licence holders • consideration of environmental implications, especially changes to water availability and flow delivery • consideration of how the conversion rate is determined (for example, is there a common conversion rate for the entire length of the river or is a scaling factor, or similar, applied based on the distance the option is downstream of Wyangala Dam?) • feedback on public acceptance of the option. Note: • conversions from general security to high security licences are currently not permitted under the water sharing plan • stakeholders saw potential in this option to enable industry growth in the Lachlan region • the department received comments on licence conversions during the consultation on the water resource plan development.
Objective	

Option 36: Improved data collection and storage

Source: Department of Planning, Industry and Environment—Water, Department of Primary Industries—Agriculture, consultation with joint organisations and councils

Description	Opportunities to improve data collection around water use by industry, the environment and towns in the Lachlan region. This would generate better information to inform future water management decisions in the region. This option would investigate opportunities to refurbish existing infrastructure (such as groundwater monitoring bores) and install new infrastructure and technology to enable better collection of water flows, levels and quality data. It would also investigate ways to harness water data collected by industries (for example, in Environmental Impact Statements and annual compliance reports). The option would also review the water monitoring programs that utilise the monitoring infrastructure. It would prepare a unified state-wide monitoring program strategy. Finally, the option would develop a plan to improve the data systems and applications used to store and retrieve water data (such as usage and licensing information).
Intent	Inform future water management in the Lachlan region (such as the operation of water sharing plans and water resource plans).
Challenges addressed	• Increased climate variability will place increased pressure on surface and groundwater resources and the ecosystems they support. • Increased climate variability poses new risks to towns, communities and industries in the Lachlan.
Potential combinations	This option would provide the basis for Option 21 (Improved understanding of groundwater processes), Option 22 (Sustainable access to groundwater) and Option 23 (Improved clarity in managing groundwater resources sustainably).
Considerations	Work by the Water Renewal Taskforce (such as new metering regulation) will assist in improving data collection on water use. This option will consider the recent announcement by the Australian Government to build a web-based, real time water information platform. Note: The department received comments on the need for improved climate data during consultation on the water resource plan development.
Objective	

Option 37: Training and information sharing programs:
- new climate data/modelling
- managing groundwater resources sustainably

Source: Department of Planning, Industry and Environment—Water, consultation with joint organisations and councils

Description	Training and information sessions on the new regional water strategy climate data and modelling to build confidence in the new approach and identify opportunities for wider use of the new datasets. Providing training and information about groundwater resources and how they are managed. This option would also consider how best to publicly share data, and what data analytics and information products are needed for different types of water users.
Intent	• Assist councils and other water users to make informed decisions about their water supply security (including groundwater). • Provide greater transparency around water management and water modelling. • Inform councils in the development of their own integrated water cycle management strategies and Regional Town Water Strategies.
Challenges addressed	Increased climate variability poses new risks to towns, communities and industries in the Lachlan.
Potential combinations	This option could be linked to other options designed to strengthen community preparedness for climate extremes, maintain and diversify water supplies, and protect and enhance natural systems.
Considerations	The option requires: • an understanding of the specific aspects that regional stakeholders in the Lachlan are interested in • an assessment of the design and distribution of the information • an assessment of whether this option could be integrated or aligned with other programs and initiatives that the department is undertaking • an assessment of the required duration of this program • an assessment of how this option would interact with the Australian Government announcement to build a web-based, real time water information platform.
Objective	

Option 38: Investigation to maintain amenity for regional towns during drought

Source: Department of Planning, Industry and Environment—Water

Description	Investigate opportunities to maintain town water features, local parks and recreational areas during extended drought and make them less 'climate dependent' so they can be permanent features of regional towns.
Intent	Enable regional town centres to remain green, particularly during dry times. This would provide multiple benefits to the community, including town amenity, improved mental and physical health (through access to recreational facilities, appealing spaces for social gatherings and the general amenity value of the town), potential economic diversity for towns (such as the ability to attract visitors and host events to support local businesses) and possibly a refuge for fish when rivers are reduced to isolated pools.
Challenges addressed	• Ensuring healthy water sources to support the region's environment, which—in turn—supports liveable communities and thriving industries. • Increased climate variability poses new risks to towns, communities and industries in the Lachlan.
Potential combinations	Potential combinations include options proposed under strengthening community preparedness for climate extremes, maintaining and diversifying water supplies, and supporting water use efficiency and conservation.
Considerations	The option requires: • an identification of high value community 'green' assets (such as town water features, local parks and recreational facilities, and street trees) • an assessment of the quantity of water required to maintain 'green' regional centres • investigation of using regional water features, such as lakes, as a fish refuge during dry times • an assessment of available alternative water sources, including treated wastewater, aquifer recharge and storage, and groundwater. Harvested stormwater is unlikely to be an option as it is not available during dry times (although it could be encouraged for passive irrigation of street trees as part of future town planning): – for recycled wastewater, the assessment will need to consider existing treatment systems and the water quality requirements of the end use, proximity of the treatment facility to key assets, and operational costs – for groundwater and surface water use, the assessment will need to consider the impact of using these sources on critical needs.
Objective	

Option 39: In-stream storage for the Lower Lachlan

Source: WaterNSW

Description	Upgrading of two existing weirs and the installation of a new weir between Hillston and Booligal to allow for the re-regulation of water released from Wyangala Dam (such as delivery surpluses). The weirs could provide an additional 2,000 ML of in-stream storage in the Lower Lachlan.
Intent	Give greater operational flexibility for WaterNSW and provide a tool to capture/manage surplus flows in the Lower Lachlan.
Challenges addressed	• Ensuring healthy water sources to support the region's environment, which—in turn—supports liveable communities and thriving industries. • Increased climate variability poses new risks to towns, communities and industries in the Lachlan.
Potential combinations	This option could be combined with options designed to protect and enhance natural systems such as Option 12 (Environmental restoration works), Option 18 (Diversion screens to prevent fish extraction at pump offtakes) and other measures. Note that many infrastructure proposals have a requirement to provide fish passage, biodiversity impact assessments and offsets for habitat loss under the *Fisheries Management Act 1994*; therefore, additional measures would be needed to mitigate impacts on the environment.
Considerations	This option was considered in the WaterNSW's *Lachlan Valley Priority Catchment Water Security Study* but was not shortlisted as the Lower Lachlan efficiency measure Option (see Option 25) was considered a superior option. The option requires: • an assessment of local and downstream impacts • an assessment of additional fish way construction • an assessment of cultural impacts • an assessment of environmental impacts of new or augmented storage capacity along with any associated changes to the operational regime of the river system on environmental flows and environmental water allocations • an assessment against the Lachlan Long Term Water Plan objectives and targets • an assessment of impacts on connectivity, riparian condition and native fish including threatened species • an assessment of any required amendments to the water sharing plan for the Lachlan regulated river • assessment of operational rules and the impact on water users and the environment. Note: • limited information is available on these two projects • stakeholders have also raised the need to upgrade Oxley Weir and 4 Mile Weir to improve efficiency to environmental targets as well as improve stock and domestic security This option has been considered as part of the WaterNSW's *Lachlan Valley Priority Catchment Water Security Study*. Since the development of the study, the NSW Government has invested in more detailed and sophisticated data and modelling methods. In particular: • climate modelling—we are using additional data to better understand climate risks and assess the potential costs and benefits of new infrastructure, policy and operational options • environmental water—we have improved how we represent held and planned environmental water in our modelling. As a result, the benefits of this option may change when assessed against the updated models.
Objective	
Further information	**WaterNSW's *Lachlan Valley Priority Catchment Water Security Study*:** **www.waternsw.com.au/projects/infrastructure-studies/belubula** **20-year infrastructure option study:** **www.waternsw.com.au/projects/infrastructure-studies/20-year-infrastructure-options-study**

Option 40: Land use change impact on water resources

Source: Community consultation

Description	Investigation of the potential impacts on water resources due to land use changes and population growth in the Lachlan region.
Intent	• Provide important information to the NSW Government to help in the decision-making process of future land use applications in the region. • Examine the feasibility of land use planning controls.
Challenges addressed	Increased climate variability poses new risks to towns, communities and industries in the Lachlan.
Potential combinations	This option could be combined with options designed to protect and enhance natural systems such as Option 12 (Environmental restoration works), Option 18 (Diversion screens to prevent fish extraction at pump offtakes) and other measures or options to improve the recognition of Aboriginal people's water rights, interests and access to water.
Considerations	The option requires: • detailed assessment of existing planning controls • improved understanding of impacts on water resources from land use changes. Note: This option will require close collaboration with other government agencies.
Objective	

Image courtesy of Destination NSW.

Improving the recognition of Aboriginal people's water rights, interests and access to water

Opportunities to protect and strengthen cultural landscape, practices, knowledge and traditions. Supporting empowerment, self-determination and economic advancement of Aboriginal people, as well as strengthen community wellbeing.

Option 41: Culturally appropriate water knowledge program

Source: Department of Planning, Industry and Environment—Water, Aboriginal consultation

Description	The management of surface and groundwater can often be complex with many layers of government playing different roles in the management and delivery of water across the Lachlan region. This option would develop a culturally appropriate water knowledge program that would aim to increase the capacity of Aboriginal people across the Lachlan so that they can more effectively participate in negotiations on water management and policy-related matters that affect them. This program could include increased communication between Aboriginal groups and all of the relevant government agencies on key topics.
Intent	• Improve the ability of Aboriginal community to understand the complexities of water management in NSW. • Improve water knowledge and participation across all ages and communities.
Challenges addressed	• Lack of culturally appropriate information about how government manage water. • Aboriginal people's rights and interests are not adequately recognised or provided for in current water laws and policies, and there are limited opportunities to influence management decisions.
Potential combinations	This could be combined with Option 42 (Water-dependent cultural practices and site identification project) and options designed to protect and enhance natural systems such as Option 19 (River Ranger Program).
Considerations	Ensure program training is created and delivered in a culturally appropriate manner. This may include: • building skills and accreditations/qualifications for key Aboriginal people who can take this back to the community • hosting training in the community or in appropriate settings • ensuring Aboriginal people have a chance to assist in the development and delivery of training programs • linking with the Nari Nari nation's water knowledge program which is currently being developed as part of the Nimmie-Caira project • hosting training with school aged children at important sites to improve knowledge and appreciation • two-way knowledge sharing between Aboriginal people and local, state and federal governments to promote improved Aboriginal cultural awareness. Note: This option could be considered at a state level through a state-wide Aboriginal water policy.
Objective	

Option 42: Water-dependent cultural practice and site identification project

Source: Department of Planning, Industry and Environment—Water, Aboriginal consultation

Description	Options for Aboriginal people to classify and map surface water-dependent and groundwater-dependent cultural sites throughout the Lachlan region. This will include the identification and mapping of cultural sites, places of spiritual significance, and places used by Aboriginal people for traditional and contemporary uses, such as hunting, recreation and economic uses. Intellectual property and cultural knowledge would be protected and retained by Aboriginal people.
Intent	• Develop a resource for Aboriginal people to help with planning of cultural and environmental water and possible impacts of other management and development decisions • Enable Aboriginal communities to educate the wider community to develop a greater understanding of cultural values and connections to rivers and wetlands across the Lachlan region.
Challenges addressed	• Aboriginal people's rights and interests are not adequately recognised or provided for in current water laws and policies, and there are limited opportunities to influence management decisions. • Aboriginal people have limited access to water allocations to use for cultural and economic purposes. • Aboriginal knowledge and science are not effectively integrated into water management in culturally appropriate ways.
Potential combinations	This could be combined with options designed to protect and enhance natural systems such as Option 19 (River Ranger Program).
Considerations	We heard from Aboriginal people in the Lachlan that: • Aboriginal people should retain ownership of information and determine how it will be used • this option should empower the broader Aboriginal community to share knowledge and improve the protection and outcomes of cultural sites and values that are important to them. Note: • mapping of different aspects of Aboriginal cultural values has previously been undertaken in the Lachlan by various agencies and organisations. These resources can assist with the implementation of this option. This includes building on the *Aboriginal Waterways Assessment* Tool and Use and Occupancy Mapping • the *Aboriginal Waterways Assessment* tool has been piloted by the Murray Lower Darling Rivers Indigenous Nations, Northern Basin Aboriginal Nations and the Murray-Darling Basin Authority and is currently being used across the Basin • this option could be considered at a state level through a state-wide Aboriginal Water Policy.
Objective	
Further information	**The Aboriginal Waterways Assessment program:** **www.mdba.gov.au/publications/mdba-reports/aboriginal-waterways-assessment-program**

Option 43: Shared benefit project (environment and cultural outcomes)

Source: Department of Planning, Industry and Environment—Water, Aboriginal consultation

Description	Water for the environment plays a vital role in sustaining the health of rivers and wetlands, and supporting their ecological, cultural and economic values. This option would investigate opportunities for shared benefits from using water for the environment to also achieve cultural outcomes, recognising it does not replace the provision of cultural flows. We have heard that this could include better engagement with communities and families along the river and consideration of impacts on cultural sites when delivering environmental water.
Intent	• Where shared benefits may exist, explore cultural outcomes from use of water for the environment. • Support, incorporate and implement traditional Aboriginal ecological knowledge into water management action plans for the environment. • Support the cultural connection of Aboriginal people to water-sustained environments.
Challenges addressed	• Aboriginal people's rights and interests are not adequately recognised or provided for in current water laws and policies, and there are limited opportunities to influence management decisions. • Aboriginal people have limited access to water allocations to use for cultural and economic purposes. • Aboriginal knowledge and science are not effectively integrated into water management in culturally appropriate ways.
Potential combinations	This could be combined with options designed to protect and enhance natural systems such as Option 19 (River Ranger Program).
Considerations	This option would need to consider: • how Aboriginal people can be involved in the decision making • how to ensure cultural values are considered • development of capacity and resources within Aboriginal communities to support their participation in environmental water planning • appropriate channels for Aboriginal community members to engage with environmental water holders to identify shared watering needs • the need and frequency of watering at different times of the year to achieve cultural outcomes • assessment of benefits to other water users (such as floodplain graziers). Note: • Environmental Water Holders are responsible for the use of environmental water. The primary consideration in using this water is the achievement of environmental outcomes • options that identify water-dependent cultural practices and sites across river systems and waterways would provide more resources for Aboriginal people to work with Environmental Water Holders • this option could be considered at a state level through a state-wide Aboriginal water policy.
Objective	

Option 44: Aboriginal cultural water access licence review

Source: Department of Planning, Industry and Environment—Water, Aboriginal consultation

Description	Water access licences allow licence holders to take water from rivers, lakes or aquifers for certain uses. This includes a category of specific purpose water access licences (Aboriginal cultural) that can only be held by Aboriginal people to access water for drinking, food preparation, washing and watering domestic gardens and cultural uses.[1]
Intent	• Optimise water sharing mechanisms that support cultural values and uses, both traditional and contemporary, recognising that Aboriginal cultural values and uses have adapted over time. • Develop a framework for cultural flow allocations.
Challenges addressed	• Aboriginal people's rights and interests are not adequately recognised or provided for in current water laws and policies, and there are limited opportunities to influence management decisions. • Aboriginal people have limited access to water allocations to use for cultural and economic purposes. • Aboriginal knowledge and science is not effectively integrated into water management in culturally appropriate ways.
Potential combinations	This could be combined with options designed to protect and enhance natural systems such as Option 19 (River Ranger Program).
Considerations	This option will need to consider: • reviewing other Aboriginal water licences (community development, environmental, commercial) including conditions of existing licences • policy and legislative options for improving licences, the application and decision-making processes and recognising Aboriginal water allocations • how the licences fit with the extraction and allocation limits within the valley • supporting services—including education and knowledge sharing about water markets and licences. Note: This option could be considered at a state level through a state-wide Aboriginal water policy.
Objective	

1. See Part 8, Section 49 (3) www.legislation.nsw.gov.au/#/view/regulation/2016/365

Option 45: Water portfolio project for Aboriginal communities

Source: Department of Planning, Industry and Environment—Water, Aboriginal consultation

Description	Funding to support Aboriginal people to purchase water entitlements and build infrastructure (such as pumps) that can be used to improve economic and cultural outcomes across the Lachlan.
Intent	• Support Aboriginal people using water entitlements (surface or groundwater) for economic and cultural purposes. • Give Aboriginal people more secure access to water for spiritual, cultural, social, environmental and economic purposes, as well as open up opportunities for investment in water-dependent initiatives and cultural projects.
Challenges addressed	• Aboriginal people's rights and interests are not adequately recognised or provided for in current water laws and policies, and there are limited opportunities to influence management decisions. • Aboriginal people have limited access to water allocations to use for cultural and economic purposes. • Aboriginal knowledge and science are not effectively integrated into water management in culturally appropriate ways.
Potential combinations	This could be combined with other options linked with improving recognition of Aboriginal people's water rights, interests and access to water.
Considerations	This option would need to consider the following: • the federal government has pledged $40 million in funds to support the acquisition of water entitlements for cultural purposes across the Murray-Darling Basin • funding needs to be sufficient to meet ongoing Aboriginal needs. Investigation will need to be undertaken into the level of demand • feedback from consultation in the region recommends that funding should be able to be used to buy infrastructure to support entitlements • consider learnings from the Basin Plan Water Efficiency Measures programs in supporting the purchase of water entitlements for cultural flows. Note: This option could be considered at a state level through a state-wide Aboriginal water policy.
Objective	
Further information	**National Cultural Flows Research Project:** www.culturalflows.com.au/

Option 46: Co-management investigation of Travelling Stock Reserves

Source: Department of Planning, Industry and Environment—Water, Aboriginal consultation

Description	Travelling Stock Reserves hold significant importance to Aboriginal people as they provide access and connection to Country, cultural practices and the protection of Aboriginal cultural heritage sites. However, Aboriginal people cannot always easily access these sites and are not well resourced to be involved in management decisions about these culturally significant sites. This option would investigate opportunities to improve the involvement of Aboriginal people in the co-management of Travelling Stock Reserves that connect them to waterways and water-dependent sites of cultural importance.
Intent	• Improve access to waterways and other water-dependent sites of cultural importance. • Support Aboriginal people's involvement in the management of Travelling Stock Reserves that connect Aboriginal people to waterways. • Support the ability of Aboriginal people to have more input on decisions that affect them and their cultural values.
Challenges addressed	• Aboriginal people's rights and interests are not adequately recognised in current water laws, policies and management decisions. • Aboriginal people have limited access to water allocations to use for cultural and economic purposes. • Aboriginal knowledge and science are not effectively integrated into water management in culturally appropriate ways.
Potential combinations	This option could be combined with other options designed to protect and enhance natural systems such as Option 19 (River Ranger Program).
Considerations	This option would need to consider Local Land Services' state-wide plan for managing the delivery of better Travelling Stock Reserves services for the community. Note: This option could be considered at a state level through a state-wide Aboriginal water policy.
Objective	

Option 47: Regional Aboriginal Water Advisory Committee

Source: Department of Planning, Industry and Environment—Water, Aboriginal Consultation

Description	Establish an Aboriginal Water Advisory Committee. This committee would improve the ability of Aboriginal groups across the region to have a unified voice on water matters that affect Aboriginal people. The committee could also be responsible for matters including: • guiding the purchase and management of water entitlements for Aboriginal nations to receive cultural flows • defining the cultural water flow needs for Aboriginal people in the region • provide representation for the wider Aboriginal community including those not part of a peak organisation or representative body.
Intent	• Improve the representation of the Aboriginal people in decision-making. • Provide a point of contact for water managers to engage with the region's Aboriginal people. • Broadly representing Aboriginal people of the region who have cultural knowledge and can speak for their country.
Challenges addressed	• Aboriginal people's rights and obligations are not adequately recognised or provided for in current water laws and policies, and there are limited opportunities to influence management decisions. • Aboriginal people have limited access to water allocations to use for cultural and economic purposes. • Aboriginal knowledge and science are not effectively integrated into water management in culturally appropriate ways.
Potential combinations	This option could be combined with other options designed to protect and enhance natural systems such as Option 19 (River Ranger Program).
Considerations	Aboriginal people have raised considerations such as having: • a suitable cross section of representatives from the region's Aboriginal people • ongoing funding for the committee • authority over certain decision making processes • legislative backing • how water entitlements could be held on behalf of the Aboriginal people. • ensuring that Aboriginal people are involved in water decision-making outside of this committee. Note: • this option will need to consider how the regional committee will interact and be involved with other groups, and the process for identifying and electing representatives to sit on the committee and appropriate governance framework • this option could be considered at a state level through a state-wide Aboriginal water policy.
Objective	

Option 48: Regional Cultural Water Officer employment program

Source: Department of Planning, Industry and Environment—Water, Aboriginal Consultation

Description	Investigate models for establishing Cultural Water Officer roles that assist with engaging with Aboriginal people regarding water management in the Lachlan. Responsibilities of this role could include: • increasing the general knowledge of the broader Aboriginal community on water management matters and the water licencing framework in a culturally appropriate way • coordinating engagement with local Aboriginal people on water management matters • promoting and supporting self-determination and representation • channelling information between Aboriginal people and government bodies and key stakeholders.
Intent	• Improve the awareness and involvement of local Aboriginal people in the management of water resources across the Lachlan. • Enable local Aboriginal people to use their local knowledge and skills to assist in decisions about water use and management. • Enable more equitable and collaborative relationships with Aboriginal people and co-designed programs.
Challenges addressed	• Aboriginal people's rights and interests are not adequately recognised or provided for in current water laws and policies, and there are limited opportunities to influence management decisions. • Aboriginal people have limited access to water allocations to use for cultural and economic purposes. • Aboriginal knowledge and science are not effectively integrated into water management in culturally appropriate ways.
Potential combinations	This could be combined with other options designed to protect and enhance natural systems such as Option 19 (River Ranger Program).
Considerations	This option would need to consider: • the operational and project budget to support the program • the location of officers and whether they would sit within government or within an Aboriginal organisation. Note: This option could be considered at a state level through a state-wide Aboriginal water policy.
Objective	 

Options not progressed

Three options that were proposed during our consultations on the Draft Lachlan Regional Water Strategy are not on the long list of options. WaterNSW has carefully considered the potential benefits and impacts of these options before recommending that they are not included in the Draft Lachlan Regional Water Strategy.

Option	Description	Reason for not progressing
Construction of a new dam at Cranky Rock	Construction of a new dam on the Belubula River with a capacity of 266,000 ML	Raising of the Wyangala Dam (Government commitment 2) was found to be a superior option compared to the construction of a new dam at Cranky Rock in terms of cost, hydrological modelling benefits, construction risk and sustainability. In particular, flooding of parts of the Cliefden Caves (heritage asset) was assessed as certain when the dam is full. Specific environmental impacts include: • loss of hydrodynamic diversity within the system, meaning a further reduction in flowing water habitat that is critical to life history stages of many native fish (including Murray Cod breeding) • creation of lentic (non-flowing) habitat that favours alien species such as carp • creation of an additional fish passage barrier that will reduce connectivity regardless of whether a fishway is included within the design of the dam.
Construction of Abercrombie Dam	Construction of a new dam upstream of Wyangala Dam on the Abercrombie River with a capacity of 700,000 ML	Raising of the Wyangala Dam (Government commitment 2) was found to be a superior option compared to the construction of a new dam on the Abercrombie River in terms of cost, hydrological modelling benefits, inundation of 2,000 ha of land and impacts on a nearby National Park (63 ha). Other environmental impacts would include impacts on threatened species that require flowing water for breeding, feeding and movement opportunities.
Storage of regulated water in Lake Cowal	Installation of regulators and related infrastructure to enable management of inflows and outflows to the privately owned lake, enabling it to act as an operational storage in the Lachlan regulated system (potential storage capacity is 194 GL)	The option was not progressed as the lake is currently privately owned and used for cropping and flood mitigation. The project could also result in additional environmental impacts due to the creation of a new regulating structure.

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