



Draft Regional Water Strategy

South Coast: Long list of options

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Acknowledging Aboriginal People: 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 Yuin Nation hold a significant connection to the lands and water covered by the South Coast Regional Water Strategy.

The South Coast 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 this nation.

We recognise the intrinsic connection of Traditional Owners to Country and acknowledge their contribution to the management of the South Coast 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.

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Options for the Draft South Coast Regional Water Strategy

As outlined in the Draft South Coast Regional Water Strategy, we have developed a long list of options 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 South Coast 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 these options together will also help to align and better sequence the various water reform processes underway to deliver the best outcomes for the South Coast 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 and delivery efficiency and conservation
- strengthening community preparedness for climate extremes.

Face-to-face engagement with Aboriginal communities on the South Coast region has been postponed due to bushfires on the South Coast in January and February 2020 and the COVID-19 pandemic. However, we are committed to also ensuring that options with a primary focus on **recognising Aboriginal people's water rights, interests and access to water** are developed and included in the strategy through face-to-face consultation with Aboriginal communities. This will also ensure we preserve our important natural systems and include the extensive knowledge of our Traditional Owners in water management decisions.

A number of options included in the current long list will contribute to recognising Aboriginal people's water rights, interests and access to water, as well as addressing one or more of the four focus areas listed above.

Table 1 shows a snapshot of how we have matched the draft options with these four categories and the challenges and opportunities we identified in the Draft South Coast Regional Water Strategy. Overall, all options that are progressed will need to contribute to the NSW Government's strategic planning vision for the region.

Supporting water use and delivery efficiency and conservation

Risks/Challenges:

- lack of water security threatens the viability and growth of regional industries
- sharing water equitably amongst all stakeholders
- lack of water security threatens town water supplies
- lack of data to inform decision-making
- water conservation for improved water efficiency.

Opportunities:

- provide transparency and confidence to water users
- educate water users about the operation of and rules governing water trade
- improve and broaden the market to create opportunities to move water more effectively
- inform future water management decisions in the South Coast region
- improve town water supply access to water
- improve industry access to water
- reduce operational losses from Brogo Dam and increase access to water for town water supply and industry
- increase water security for industry
- increase resilience of the regional water supply.

Strengthening community preparedness for climate extremes

Risks/Challenges:

- region is vulnerable to extended dry periods
- lack of water security threatens the viability and growth of regional industries
- lack of water security threatens town water supplies
- lack of water security impacts communities
- climate change will exacerbate the impacts of poor catchment management; increasing the frequency of poor water quality events
- lack of data to inform decision-making.

Opportunities:

- slow the movement of water through the catchment
- reduce stream-bed and bank erosion
- improve water quality in watercourses
- attenuate minor flood flows
- increase in-channel water storage and groundwater recharge
- provide clarity in decision-making during periods of drought
- mitigate impacts of urban and rural land management practices on water quality
- identify alternative water sources and storage for a more diverse and secure water supply
- prepare for the impacts of climate change and sea level rise on groundwater sources in coastal regions
- sustainable access to groundwater resources by all water users
- provide for development while protecting groundwater resources
- increase water security for industry
- improve drought resilience of industry.

Table 1. Draft long list of options matrix (continued)

Category	Maintaining and diversifying water supplies	Protecting and enhancing natural systems
<p>Options and government commitments</p>	<ul style="list-style-type: none"> • Pipeline from Brogo Dam to Bega-Tathra town water supply system • A reserve volume for the Brogo-Bermagui town water supply system • Water treatment plant for Brogo-Bermagui town water supply system • Water treatment plant for Yellow Pinch Dam • Upgrade water main between Bewong and Milton • Pipeline connecting Bega Valley Shire Council and Eurobodalla Shire Council town water supply systems • Vulnerability of surface water supplies to sea level rise • Reuse of reclaimed water • Managed aquifer recharge investigations and policy • Desalination for supply augmentation • Instream dam at Reedy Creek • Eurobodalla Southern Storage • Increased harvestable rights for coastal draining catchments • Improve releases from Cochrane Dam to better match the water demands of irrigators • Increased industry access to high flows • Increased on-farm water storage • A grid of off-stream storages in the Bega Valley • Tuross River barrage • Increase capacity of Cochrane Dam • Brown Mountain Water Project (pumped hydro scheme) • Instream dam at Crystalbrook 	<ul style="list-style-type: none"> • Establish sustainable extraction limits for South Coast surface water and groundwater sources • Shift extractions from low streamflows to high streamflows • Extend water and sewer services to southern villages (Shoalhaven Water) • Southern Reclaimed Water Management Scheme • Merimbula Effluent Management Scheme • Fish-friendly water extraction • Improved fish passage in South Coast rivers • Improve stormwater management • Bringing back riverine and estuarine habitats and threatened species • Characterising coastal groundwater resources • Protecting ecosystems that depend on coastal groundwater resources

Table 1. Draft long list of options matrix

Category	Maintaining and diversifying water supplies	Protecting and enhancing natural systems
<p>Region-specific challenges and opportunities</p>	<p>Risks/Challenges:</p> <ul style="list-style-type: none"> • lack of water security threatens the viability and growth of regional industries • lack of water security threatens town water supplies • sea level rise threatens agricultural industries • sea level rise threatens town water supplies • climate change and sea level rise threaten the security of coastal water sources • region is likely to experience future droughts more severe than those on record • major rivers in the region are under hydrologic stress • sharing water equitably amongst all stakeholders. <p>Opportunities:</p> <ul style="list-style-type: none"> • increase water security for town water supplies • improve drought resilience of agricultural enterprises • increase water security for agricultural enterprises • reduce public health risk • improve the financial operation of Brogo Dam • increase the capacity of the region to manage the impacts of sea level rise • understand the vulnerability of surface water supplies and sewerage operations to sea level rise • improve the resilience of water supplies for towns and industry • increase resilience of the regional water supply, through the recovery and reuse of treated wastewater • more efficient use (by minimising evaporation) of stored water in areas where demand is high • increase water security for industry • improve drought resilience of industry • reduce extractions from low streamflows • reduce competition for water during low flows. 	<p>Risks/Challenges:</p> <ul style="list-style-type: none"> • sharing water equitably amongst all stakeholders • major rivers in the region are under hydrologic stress • lack of water security threatens the viability and growth of regional industries • protecting water resources (coastal lakes and aquifers) from pollution • lack of water security impacts upon environmental assets • sea level rise threatens environmental assets • poor water quality is affecting the environmental health of water sources • protecting native and threatened aquatic species • dams and other water delivery infrastructure alter natural flow regimes which impacts on water quality, native species and ecosystems • climate variability and change will place increased pressure on surface and groundwater resources and the ecosystems they support • improved recognition of the relationship between healthy riparian zone and river outcomes with availability of water from increased channel storage for waterways managed on a total catchment management basis • lack of water security threatens town water supplies • sea level rise threatens town water supplies • sustainable access to groundwater resources by all water users • lack of data to inform decision-making. <p>Opportunities:</p> <ul style="list-style-type: none"> • improve our understanding of coastal river systems and their sustainable extraction limits • set extraction limits that optimise production and maintain natural ecosystems • protect water resources (coastal lakes and aquifers) from septic pollution • protect water resources (coastal lakes and aquifers) from effluent discharges • reduce extractions from low streamflows • off-set the use of reticulated water for irrigating golf courses and playing fields • protect the area's unspoilt aquatic and land environment and ensure public health standards are met • ensure sustainable access to groundwater by both consumptive water users and the environment • reduce the loss of native fish in the South Coast region while improving water delivery and efficiency • improve fish movement through fishways and encourage breeding and spawning activities, especially for threatened species • improve recreational and cultural fishing and regional tourism opportunities • improve water quality in watercourses • facilitate access to water for productive use where available • increase water security for industry • improve drought resilience of industry • increase water security for town water supplies • increase water security for agricultural enterprises • maintain and improve native fish access to core habitat in the South Coast region • increase resilience of the regional water supply and improve water quality and local flood risk management, through improved stormwater management • ensure the NSW Government and the community have the required data and knowledge to inform groundwater management frameworks and decisions • improve knowledge sharing and education.

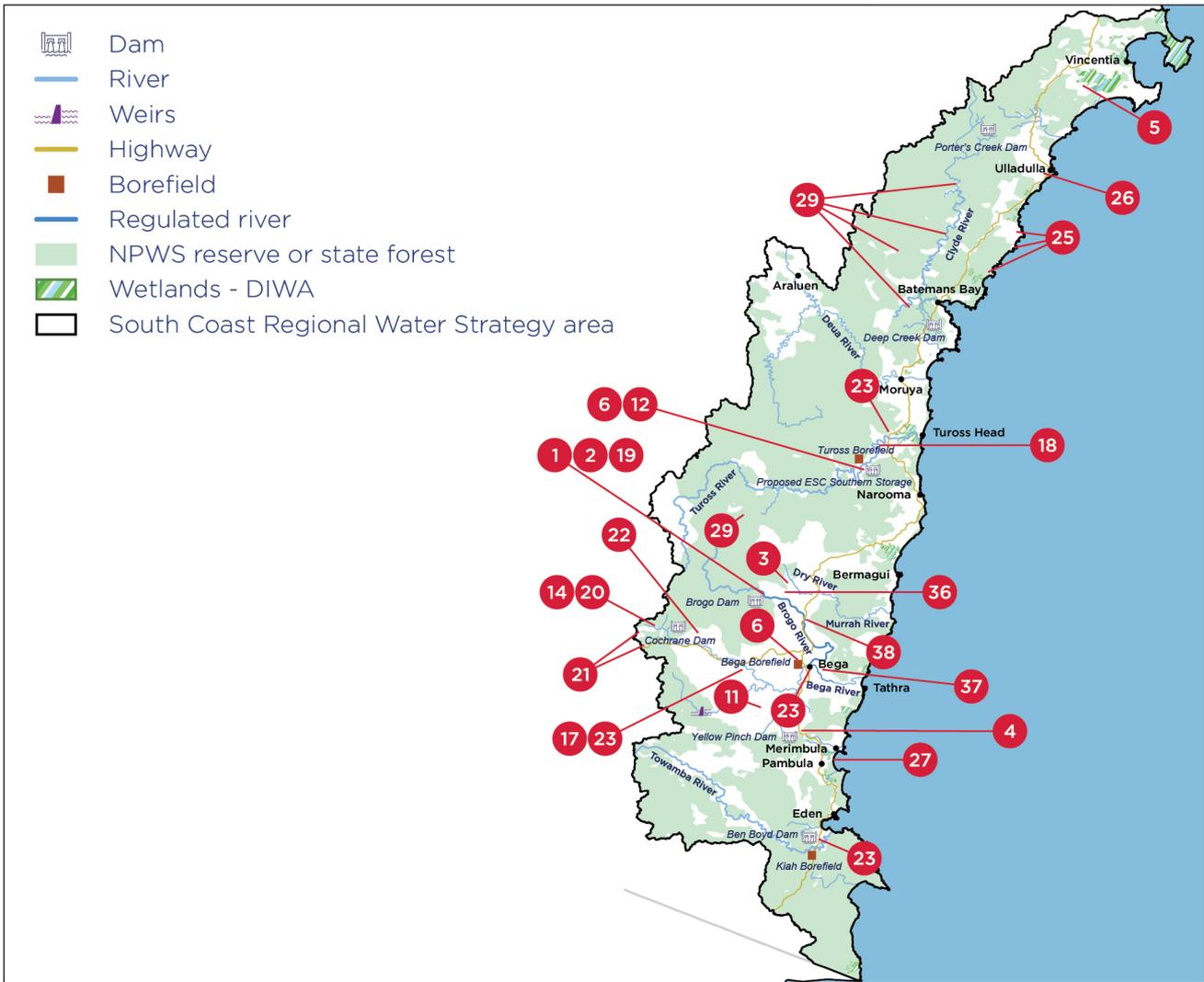
Supporting water use and delivery efficiency and conservation

- Active and effective water markets
- Improved data collection and information sharing
- Weir at Brogo-Bermagui town water supply off-take
- Shorten the Bega-Brogo regulated river system
- Increase general security allocations in the Bega-Brogo regulated river system
- Regional network efficiency audit

Strengthening community preparedness for climate extremes

- River Recovery Program for the South Coast: a region-wide program of instream works, riparian vegetation and sediment control
- Apply the NSW Extreme Events Policy to the South Coast region
- Quantify the resource potential of South Coast hard rock aquifers
- Planning for climate change impacts on coastal groundwater resources
- Planning for land use pressures on coastal groundwater resources

Figure 1. South Coast long list of options and government commitments map



Options not shown on the map are not location specific.

Long list of options

Maintaining and diversifying water supplies

1. Pipeline from Brogo Dam to Bega-Tathra town water supply system
2. A reserve volume for the Brogo-Bermagui town water supply system
3. Water treatment plant for Brogo-Bermagui town water supply system
4. Water treatment plant for Yellow Pinch Dam
5. Upgrade water main between Bewong and Milton
6. Pipeline connecting Bega Valley Shire Council and Eurobodalla Shire Council town water supply systems
7. Vulnerability of surface water supplies to sea level rise
8. Reuse of reclaimed water
9. Managed aquifer recharge investigations and policy
10. Desalination for supply augmentation
11. Instream dam at Reedy Creek
12. Eurobodalla Southern Storage
13. Increased harvestable rights for coastal draining catchments
14. Improve releases from Cochrane Dam to better match the water demands of irrigators
15. Increased industry access to high flows

16. Increased on-farm water storage

17. A grid of off-stream storages in the Bega Valley
18. Turross River barrage
19. Increase capacity of Brogo Dam
20. Increase capacity of Cochrane Dam
21. Brown Mountain Water Project (pumped hydro scheme)
22. Instream dam at Crystalbrook

Protecting and enhancing natural systems

23. Establish sustainable extraction limits for South Coast surface water and groundwater sources
24. Shift extractions from low streamflows to high streamflows
25. Extend water and sewer services to southern villages (Shoalhaven Water)
26. Southern Reclaimed Water Management Scheme
27. Merimbula Effluent Management Scheme
28. Fish-friendly water extraction
29. Improved fish passage in South Coast rivers
30. Improve stormwater management
31. Bringing back riverine and estuarine habitats and threatened species
32. Characterising coastal groundwater resources

33. Protecting ecosystems that depend on coastal groundwater resources

Supporting water use and delivery efficiency and conservation

34. Active and effective water markets
35. Improved data collection and information sharing
36. Weir at Brogo-Bermagui town water supply off-take
37. Shorten the Bega-Brogo regulated river system
38. Increase general security allocations in the Bega-Brogo regulated river system
39. Regional network efficiency audit

Strengthening community preparedness for climate extremes

40. River Recovery Program for the South Coast: a region-wide program of instream works, riparian vegetation and sediment control
41. Apply the NSW Extreme Events Policy to the South Coast region
42. Quantify the resource potential of South Coast hard rock aquifers
43. Planning for climate change impacts on coastal groundwater resources
44. Planning for land use pressures on coastal groundwater resources

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*.¹ The final package of options will also consider how the implementation of the preferred options should be staged.

This document describes each option, its intent and the challenges it seeks to address. Each option is aligned with one or more of the overarching objectives set for the NSW regional water strategies (Figure 2). 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 on the option.

The list also identifies potential combinations of options. These combinations recognise that most options require associated works, further assessments and/or legislative and policy and planning changes to ensure they address the risks and challenges identified in the South Coast 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 these objectives and the NSW Government's focused planning goals for the region.

Figure 2. NSW regional water strategies: objectives



1. *Regional Water Strategies Guide*, www.industry.nsw.gov.au/water/plans-programs/regional-water-strategies/about



South Coast: Long list of options and government commitments

Maintaining and diversifying water supplies

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

Option 1. Pipeline from Brogo Dam to Bega-Tathra town water supply system	
<i>Source: WaterNSW</i>	
Description	With forecasted rises in sea level, more extreme droughts and increased demands on water resources (surface and alluvial), saltwater ingress into the Bega Sands aquifer presents a potential risk to the security of the Bega town water supply. A pipeline from Brogo Dam into the Bega-Tathra town water supply would provide an alternative supply of water should saltwater ingress risks to the current groundwater source become too great.
Intent	Increase water security for town water supplies.
Challenges addressed	<ul style="list-style-type: none"> • Sea level rise threatens town water supplies. • Lack of water security threatens town water supplies.
Potential combinations	<p>This option would be informed by:</p> <ul style="list-style-type: none"> • Option 43. Planning for climate change impacts on coastal groundwater resources. <p>It could also be combined with:</p> <ul style="list-style-type: none"> • Option 2. A reserve volume for the Brogo-Bermagui town water supply system • Option 6. Pipeline connecting Bega Valley Shire Council and Eurobodalla Shire Council water supply systems • Option 7. Vulnerability of surface water supplies to sea level rise • Option 10. Desalination for supply augmentation • Option 19. Increase capacity of Brogo Dam • Option 39. Regional network efficiency audit.
Considerations	<p>This option is not required unless saltwater ingress is assessed as a threat to town water supply security. Accordingly, an assessment of saltwater intrusion risks to the Bega town water supply is required in the first instance.</p> <p>Alternatively, this option could provide water for the Bega-Tathra town water supply system in the case that the Bega Sands groundwater source become contaminated through other means.</p> <p>Constructing a pipeline from Brogo Dam to the Bega-Tathra town water supply system through the Brogo Pass would be topographically challenging.</p> <p>This option has been discussed with WaterNSW customers at Level of Service workshops. This was considered the preferred pipeline option by Bega Valley Shire Council, should a pipeline be considered to meet the growth of the local government area.</p> <p>This option would require changes to water sharing arrangements and clarification of water held in reserve for town water supplies. An increase to the capacity of Brogo Dam may be considered to facilitate this option as the dam is currently oversubscribed, and Bega Valley Shire Council does not hold existing entitlements for use within the Bega-Tathra system.</p>
Objectives	
Further information	<p>WaterNSW's 20-year Infrastructure Options Study: www.waternsw.com.au/projects/infrastructure-studies/20-year-infrastructure-options-study</p>

Option 2. A reserve volume for the Brogo-Bermagui town water supply system

Source: Bega Valley Shire Council

Description	<p>Bega Valley Shire Council has expressed concerns about the security of its town water supply from Brogo Dam. Once the dam drops to critical levels, the priority of water supply is not clear. Historically, WaterNSW has restricted access to general security water once the level in Brogo Dam drops below 1,200 ML. This reserve is used to provide water for high priority users, such as those holding high security, stock and domestic and local water utility water access licences.</p> <p>This option would investigate changing the reserve to improve the ability for Brogo Dam to deliver water to the Brogo-Bermagui town water supply system during extreme events.</p>
Intent	<p>Increase water security for town water supplies.</p>
Challenges addressed	<p>Lack of water security threatens town water supplies.</p>
Potential combinations	<p>This option could be combined with:</p> <ul style="list-style-type: none"> • Option 1. Pipeline from Brogo Dam to Bega-Tathra town water supply system • Option 3. Water treatment plant for Brogo-Bermagui town water supply system • Option 10. Desalination for supply augmentation • Option 19. Increase capacity of Brogo Dam • Option 34. Active and effective water markets • Option 36. Weir at Brogo-Bermagui town water supply off-take • Option 39. Regional network efficiency audit.
Considerations	<p>This option requires:</p> <ul style="list-style-type: none"> • assessing town water security risks under the current reserve rules • identifying sufficient reserve volumes • investigating how releases from the reserve would be managed, including how dam releases should be managed prior to dropping below the reserve level • assessing the impacts on water access licence holders in the Bega-Brogo regulated river system • assessing the potential environmental impacts • amending water sharing arrangements and clarification of water held in reserve for town water supplies • stakeholder feedback would be required to understand the potential impacts to water users and the environment.
Objectives	

Option 3. Water treatment plant for Brogo-Bermagui town water supply system

Source: Bega Valley Shire Council

<p>Description</p>	<p>The Brogo-Bermagui water supply system supplies drinking water to Quaama, Cobargo, Bermagui, Beauty Point, Fairhaven, Wallaga Lake, Wallaga Lake Heights, Akolele and Wallaga Lake Koori Village. Brogo River downstream of Brogo Dam is the main source of water for the system.</p> <p>Water supplied by this town water supply system receives minimal treatment, making the system susceptible to poor water quality following events such as floods and bushfire. ‘Boil water’ notices have been issued on several occasions over the last decade—the latest following the significant rainfall events in March 2017 and August 2020.</p> <p>The NSW Government, under the Safe and Secure Water Program, has committed \$10 million to the design and construction of a water treatment plant for the Brogo-Bermagui town water supply. The concept design for the proposed 3.5 ML/day water treatment plant was completed in August 2020 with tenders for the detailed design and construction closing on 1 October. Commissioning of the new water treatment plant is anticipated in mid 2022.</p> <p>The construction of the Brogo-Bermagui Water Treatment Plant is a NSW Government commitment.</p>
<p>Intent</p>	<ul style="list-style-type: none"> • Reduce public health risk. • Increase water security for town water supplies.
<p>Challenges addressed</p>	<p>Lack of water security threatens town water supplies.</p>
<p>Potential combinations</p>	<p>This option could be combined with:</p> <ul style="list-style-type: none"> • Option 19. Increase capacity of Brogo Dam • Option 35. Improved data collection and information sharing • Option 36. Weir at the Brogo-Bermagui town water supply off-take • Option 39. Regional network efficiency audit • Option 40. River Recovery Program for the South Coast: a region-wide program of instream works, riparian vegetation and sediment control.
<p>Considerations</p>	<p>Poor water quality in the Brogo catchment is a particularly relevant issue at present due to the combination of bushfires during the summer of 2019/2020 followed by intense rainfall events during autumn and winter. Bushfire increases ash and sediment loads into the storage during subsequent wet weather and increases the medium term risk of algal events occurring.</p>
<p>Objectives</p>	
<p>Further information</p>	<p>Bega Valley Shire Council: begavalley.nsw.gov.au/cp_themes/default/page.asp?p=DOC-VAD-06-81-62</p>

Option 4. Water treatment plant for Yellow Pinch Dam

Source: Bega Valley Shire Council

Description	<p>Yellow Pinch Dam (3,000 ML) is Bega Valley Shire Council’s major water storage supplying water to Merimbula, Tura Beach, Pambula Beach and Pambula. Water supplied by this town water supply system receives minimal treatment. Algal blooms and lack of multiple treatment barriers for pathogens are the main drivers for a water treatment plant at Yellow Pinch.</p> <p>Bega Valley Shire Council has secured \$75,000 (25% of total costs) under the Safe and Secure Water Program towards a scoping study into a new water treatment plant at Yellow Pinch.</p>
Intent	<ul style="list-style-type: none"> • Reduce public health risk. • Increase water security for town water supplies.
Challenges addressed	<p>Lack of water security threatens town water supplies.</p>
Potential combinations	<p>This option could be combined with:</p> <ul style="list-style-type: none"> • Option 35. Improved data collection and information sharing • Option 40. River Recovery Program for the South Coast: a region-wide program of instream works, riparian vegetation and sediment control.
Objectives	

Option 5. Upgrade water main between Bewong and Milton

Source: Shoalhaven Water

<p>Description</p>	<p>Shoalhaven Water’s Southern System (Milton, Ulladulla and Mollymook) is serviced substantially by Porters Creek Dam in the Clyde River catchment. During times of peak demand, water can be accessed from the Northern System, which sources its water from the Shoalhaven River. The connection between the Northern and Southern systems may create a bottleneck to water supply in the future.</p> <p>The current pipeline between Bamarang water treatment plant and Bewong is 600 mm diameter. Planning was underway to extend the 600 mm water main from Bewong to Milton (the existing pipe is 200 mm), but a decrease in water demands in response to the release of the <i>Best-Practice Management of Water Supply and Sewerage Guidelines</i> and pay-for-use charges has deferred the need to extend the pipeline.</p> <p>Approximately 20 km of 600 mm water main would need to be constructed to allow peak demands from the southern Shoalhaven region to be serviced from the Northern System.</p>
<p>Intent</p>	<p>Increase water security for town water supplies.</p>
<p>Challenges addressed</p>	<ul style="list-style-type: none"> • Lack of water security threatens town water supplies. • Lack of water security threatens the viability and growth of regional industries.
<p>Potential combinations</p>	<p>This option could be combined with other options focused on increasing the resilience of Shoalhaven Water’s Southern System.</p>
<p>Considerations</p>	<p>With little scope to increase water supply from Porters Creek Dam, it appears inevitable that the Southern System will depend more on supplies from the Northern System in the future if total water demands increase.</p> <p>An indicative cost for this project is \$20 million.</p> <p>Pending funding, this project could be undertaken once warranted by water demand projections.</p>
<p>Objectives</p>	

Option 6. Pipeline connecting Bega Valley Shire Council and Eurobodalla Shire Council town water supply systems

Source: Department of Planning, Industry and Environment—Water

Description	<p>This option would connect the Bega-Tathra and Southern Eurobodalla town water supply systems. This would improve system resilience by increasing and diversifying the water supplies available in both the Bega and Eurobodalla regions. It can also improve the feasibility of a major augmentation, such as increasing Brogo Dam’s capacity, by making the additional water available to both systems.</p>
Intent	<p>Increase water security for town water supplies.</p>
Challenges addressed	<ul style="list-style-type: none"> • Sea level rise threatens town water supplies. • Lack of water security threatens town water supplies.
Potential combinations	<p>This option could be combined with:</p> <ul style="list-style-type: none"> • Option 1. Pipeline connecting Brogo Dam to Bega-Tathra town water supply system • Option 7. Vulnerability of surface water supplies to sea level rise • Option 10. Desalination for supply augmentation • Option 12. Eurobodalla Southern Storage • Option 19. Increase capacity of Brogo Dam • Option 39. Regional network efficiency audit.
Considerations	<p>Bega Valley Shire Council and Eurobodalla Shire Council have numerous water sources that are already part of inter-connected town water supply systems. This means that transferring water would be costly.</p> <p>Eurobodalla Shire Council considered its long-term water security options in their integrated water cycle management strategy and has since determined to progress with a solution (the Southern Storage) that potentially rules out this option in the short term. Council did not evaluate this option in its integrated water cycle management.</p> <p>While there is little interest in this option due to Eurobodalla Shire Council’s commitment to the Southern Storage (Option 12), it may be worth considering as part of a future augmentation strategy if options such as increasing the capacity of Brogo Dam are progressed.</p>
Objectives	
Further information	<p>Eurobodalla Shire Council Integrated Water Cycle Management Strategy: www.esc.nsw.gov.au/inside-council/community-and-future-planning/strategies/integrated-water-cycle-management</p>



Option 7. Vulnerability of surface water supplies to sea level rise

Source: Department of Planning, Industry and Environment—Water

<p>Description</p>	<p>This option would investigate the potential impacts of sea level rise on surface water supplies and local water utility infrastructure in tidal pools and estuaries.</p> <p>The project involves:</p> <ul style="list-style-type: none"> • identifying key estuaries/tidal pools for investigation based on the volume of water extraction and location of water infrastructure • reviewing the availability and suitability of existing hydrodynamic and salinity numerical models at priority locations • updating and/or developing the numerical models necessary to determine how salinity dynamics and tidal inundation may change at key locations in the future due to sea level rise and future changes in hydrology • assessing risks to water users and local water utility infrastructure posed by sea level rise and future changes in hydrology • identifying options to address these risks for inclusion in future reviews of the South Coast Regional Water Strategy.
<p>Intent</p>	<ul style="list-style-type: none"> • Understand the vulnerability of surface water supplies and sewerage operations to sea level rise. • Improve the resilience of water supplies for towns and industry.
<p>Challenges addressed</p>	<ul style="list-style-type: none"> • Sea level rise threatens town water supplies. • Sea level rise threatens agricultural industries.
<p>Potential combinations</p>	<p>This project could link in with work being carried out under Initiative 3 of the <i>Marine Estate Management Strategy</i> to understand the vulnerability of tidal wetlands to sea level rise.</p> <p>In addition to the coastal management planning being undertaken by councils, it will also complement:</p> <ul style="list-style-type: none"> • Option 32. Characterising coastal groundwater resources • Option 35. Improved data collection and information sharing. <p>A better understanding of the vulnerability of surface water supplies to sea level rise will also inform the investigations into Option 18. Tuross River barrage and Option 37. Shorten the Bega-Brogo regulated river system.</p> <p>This option could also be combined with Option 6. Pipeline connecting Bega Valley Shire Council and Eurobodalla Shire Council town water supply systems and Option 19. Increase capacity of Brogo Dam.</p>
<p>Considerations</p>	<p>The development of fit-for-purpose hydrodynamic and salinity models is resource intensive and expensive so model development will be prioritised based on a coastal-wide needs assessment. Several models already exist or are being developed to inform various coastal management initiatives and this project will look to build on this work to avoid duplication.</p> <p>The South Coast Regional Water Strategy may propose options that alter the hydrology of estuary and tidal pool inflows. Developing new or updated models will enable the salinity and inundation impacts of these options to be assessed.</p>
<p>Objectives</p>	

Option 8. Reuse of reclaimed water

Source: Department of Planning, Industry and Environment—Water

<p>Description</p>	<p>Treated wastewater from sewage treatment plants has the potential to be a reliable, safe and mostly climate-independent water source. The level of treatment required for wastewater depends on whether it will be stored or conveyed by rivers or groundwater, and what the end uses are. Water to be used for drinking requires higher levels of treatment and purification than water used by industry and agriculture. Reuse of reclaimed water involves augmenting water supplies through:</p> <ul style="list-style-type: none"> • managed aquifer recharge, whereby reclaimed water is used to recharge groundwater aquifers • discharging reclaimed water into rivers upstream of potential water users or environmental assets • substituting existing or future uses of potable or raw water, including for end-uses such as irrigation of open spaces or for agriculture. <p>Recharging coastal streams and alluvial aquifers with reclaimed water could counteract some of the impacts of sea level rise and provide additional water for extractive use and environmental assets.</p> <p>This option will identify and evaluate potential locations across the region to increase use of reclaimed water, including purified recycled water for drinking.</p>
<p>Intent</p>	<p>Increase resilience of the regional water supply, through the recovery and reuse of treated wastewater.</p>
<p>Challenges addressed</p>	<ul style="list-style-type: none"> • Climate change and sea level rise threaten the security of coastal water sources. • Region is likely to experience future droughts more severe than those on record.
<p>Potential combinations</p>	<p>This option could be combined with:</p> <ul style="list-style-type: none"> • Option 9. Managed aquifer recharge investigations and policy • Option 18. Tuross River barrage • Option 37. Shorten the Bega-Broggo regulated river system.
<p>Considerations</p>	<p>Purified recycled water for drinking involves high levels of treatment, including reverse osmosis. Any treatment process involving reverse osmosis will produce a brine which can be discharged more safely to ocean, but in most cases not to inland waterways.</p> <p>Recycling wastewater and stormwater avoids discharge to rivers and the ocean of water likely to contain sediment or nutrients, reducing pollutants released to waterways.</p> <p>Local water utilities have investigated reuse opportunities as part of their strategic planning. Shoalhaven Water’s Reclaimed Water Management Scheme is one of the largest and more complex water recycling schemes undertaken by a regional water utility providing a secure water source to local dairy farms, golf courses and sporting grounds.</p> <p>Due to advanced treatment requirements and associated infrastructure reclaimed water options generally have higher energy requirements than surface water options, although less than desalination options.</p> <p>The advanced treatment requirements may also make it challenging for regional local water utilities to implement due to a lack of skilled operators.</p> <p>Experience in developing reclaimed water solutions for drinking water supply in Australia and overseas has demonstrated that community trust and acceptance needs to be built carefully and may take around 10 years. The community’s willingness to consider reclaimed water for drinking purposes needs to be carefully consulted on and tested.</p> <p>Any risk of system failure resulting in inadequately treated water entering the potable network would need to be overcome.</p>
<p>Objectives</p>	



Option 9. Managed aquifer recharge investigations and policy

Source: Department of Planning, Industry and Environment—Water

Description	<p>Investigation of possible sites for temporary storage of treated wastewater, stormwater and river flows in aquifers to improve storage efficiencies. This is normally referred to as managed aquifer recharge. This option would develop a policy and regulatory framework to enable the storage and recovery of this water.</p> <p>Stored water could be reused by towns, water users or groundwater-dependent ecosystems.</p>
Intent	<p>More efficient use (by minimising evaporation) of stored water in areas where demand is high.</p>
Challenges addressed	<ul style="list-style-type: none"> • Region is likely to experience future droughts more severe than those on record. • Major rivers in the region are under hydrologic stress. • Lack of water security threatens town water supplies.
Potential combinations	<p>This option builds on Option 23. Establish sustainable extraction limits for South Coast surface water and groundwater sources.</p> <p>It could also be combined with:</p> <ul style="list-style-type: none"> • Option 8. Reuse of reclaimed water • Option 30. Improved stormwater management • Option 32. Characterising coastal groundwater resources • Option 44. Planning for land use pressures on coastal groundwater resources.
Considerations	<p>Managed aquifer recharge requires careful control of injected water quality and quantity. Injection of water to an aquifer can result in dryland salinity, caused by a rising water table which brings with it dissolved salts from the soil profile. This can have severe impacts on soil and vegetation health and can affect the salinity profile of rivers and creeks.</p> <p>Managed aquifer recharge feasibility in the South Coast is limited by the local geology. The coastal sands aquifers of the South Coast region are particularly susceptible to contamination so managed aquifer recharge suitability may be limited. The assessment of this option in these groundwater sources would have to be site-specific. The need for additional treatment before injection would limit managed aquifer recharge possibilities as it would increase its cost. This also applies to the Sydney Basin South Coast Source.</p> <p>Floodplain alluvial and upriver alluvial sources have technical and operational limitations due to the need to pre-treat water before injection, thus increasing the cost. The need for storage before injection in the upriver alluvials would also increase its cost and limit feasibility.</p> <p>This option requires:</p> <ul style="list-style-type: none"> • consideration of the distribution of benefits (such as additional water because of reduced evaporation) among consumptive water users and the environment • consideration of equity issues between 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.
Objective	

Option 10. Desalination for supply augmentation

Source: Department of Planning, Industry and Environment—Water

Description	<p>Desalination can be an attractive option for coastal regions as it offers a virtually unlimited, climate-independent source of water. Desalination plants can be constructed as decentralised units servicing specific water demands or, depending on town water supply infrastructure, can supply regional demands. Desalination units may consist of small-scale, modular plants sited close to a water demand and may be scaled up as the water demand of a town or region grows.</p>
Intent	<p>Increase water security for town water supplies.</p>
Challenges addressed	<p>Lack of water security threatens town water supplies.</p>
Potential combinations	<p>This option could be combined with:</p> <ul style="list-style-type: none"> • Option 1. Pipeline from Brogo Dam to Bega-Tathra town water supply system • Option 2. A reserve volume for the Brogo-Bermagui town water supply system • Option 6. Pipeline connecting Bega Valley Shire Council and Eurobodalla Shire Council water supply systems • Option 7. Vulnerability of surface water supplies to sea level rise • Option 23. Establish sustainable extraction limits for South Coast surface water and groundwater sources • Option 39. Regional network efficiency audit.
Considerations	<p>Desalination was considered in the Eurobodalla Shire Council’s integrated water cycle management strategies of 2016 and 2003, and was ranked as the second preference for the long-term water security for the region after the Southern Storage option. Desalination is currently not a priority for Bega Valley Shire.</p> <p>A regional desalination facility would provide the greatest benefit if the Bega Valley Shire Council and Eurobodalla Shire Council networks were connected. Due to the large infrastructure requirements of such interconnections and the desalination facility, this is likely to be a longer term option that would be developed after immediate supply augmentation needs are met across the region.</p> <p>The siting of desalination plants could also be problematic. Many suitable locations are prized for their aesthetic value and communities may resist the construction of desalination plants in their areas. The success of this option would depend largely on finding suitable sites and suitable technologies with small footprints.</p> <p>Brine disposal can be problematic. However, methods and technologies for brine disposal are advancing and it is possible to mitigate possible aesthetic and environmental impacts. Some disposal methods can have economic benefits (e.g. salt production).</p> <p>We have heard from councils that the energy requirements for desalination facilities may make it less attractive to community stakeholders. Environmental issues resulting from greenhouse gas emissions may be associated with operation of a desalination plant. As such, this option may require consideration of green energy options to offset community concern or requirements relating to zero carbon and climate change implications.</p> <p>It would be important to engage stakeholders on how desalination options could improve resilience in water supplies over the long term. Desalination would be used to supplement regional water supplies, rather than being the primary source.</p> <p>The objectives of the <i>Coastal Management Act 2016</i> and <i>Marine Estate Management Act 2014</i> must also be considered.</p>
Objectives	
Further information	<p>www.esc.nsw.gov.au/inside-council/community-and-future-planning/strategies/integrated-water-cycle-management</p>

Option 11. Instream dam at Reedy Creek

Source: *Bega Valley Water Storages Committee*

<p>Description</p>	<p>The Bega River Catchment Water Storages Project (Stage 1) investigated the feasibility of a range of water storage options for the Bega River catchment (refer to Option 17).</p> <p>The project included options for constructing an instream dam (1.1 GL or 4 GL) on Reedy Creek, a tributary of Candelo Creek. Hydrologic modelling as part of this project indicated that a 1.1 GL dam on Reedy Creek would provide 80% reliability to downstream irrigators, and a 4 GL dam would provide 90% reliability.</p> <p>A dam on Reedy Creek would offer the option of providing town water supplies by constructing a pipeline from the dam site to Bega Valley Shire Council's existing Tantawanglo pipeline.</p>
<p>Intent</p>	<ul style="list-style-type: none"> • Increase water security for industry. • Increase water security for town water supplies. • Improve drought resilience of industry. • Reduce extractions from low streamflows.
<p>Challenges addressed</p>	<ul style="list-style-type: none"> • Lack of water security threatens the viability and growth of regional industries. • Lack of water security threatens town water supplies.
<p>Potential combinations</p>	<p>This option could be combined with:</p> <ul style="list-style-type: none"> • Option 16. Increased on-farm water storage • Option 17. A grid of off-stream storages in the Bega Valley • Option 39. Regional network efficiency audit • Option 40. River Recovery Program for the South Coast: a region-wide program of instream works, riparian vegetation and sediment control.
<p>Considerations</p>	<p>Since the development of the SMEC study, the NSW Government has invested in more detailed and sophisticated data and modelling methods. In particular:</p> <ul style="list-style-type: none"> • 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. <p>As a result, the benefits of this option may change when assessed against the updated models.</p> <p>This option requires:</p> <ul style="list-style-type: none"> • assessment of potential impacts on cultural heritage sites • assessment of inundation impacts on landholders in the vicinity of the storage • assessment of changes to existing river flow patterns and planned environmental water • assessment of cold water pollution impacts • consideration of the distribution of benefits amongst consumptive water users and the environment • assessment of flow modifications or changed operational regime on connectivity including fish passage, native fish (including threatened species), ecological communities and ecosystems • assessment of flow modifications on water quality from reduced freshes or moderate flows, and high flow events • assessment of flow modifications on riparian vegetation, Endangered Ecological Communities and stream geomorphology, including recovery of vegetation from bank full/channel forming events • assessment of the impacts of changes of the flow regime on the natural stream function including any off-setting measures • review and amendments to the <i>Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources 2011</i>. <p>This option would require assessment under the <i>Fisheries Management Act 1994</i>.</p> <p>Environmental assessment processes require sufficient scope to consider the cumulative impact of combined infrastructure options.</p>
<p>Objectives</p>	
<p>Further information</p>	<p>SMEC 2008, <i>Bega River Catchment Water Storage Project</i>, SMEC.</p>

Option 12. Eurobodalla Southern Storage

Source: Eurobodalla Shire Council

<p>Description</p>	<p>Eurobodalla Shire Council has proposed the construction of an off-stream storage in the Tuross Valley, the 'Eurobodalla Southern Storage', to meet its aspirations for future levels of service. The project involves constructing an off-river storage on an unnamed tributary of the Tuross River. Works include:</p> <ul style="list-style-type: none"> • 3,000 ML of water storage capacity • a new river intake pump station with a total river extraction capacity made up of a combination of flows from the river intake and the existing borefield (up to 26 ML/day). <p>Water will be stored in the proposed water storage facility to supplement the existing water supply network during periods of drought. The water storage facility will also supplement peak summer demands and provide sufficient water storage to allow the system to provide a secure yield in accordance with State Government guidelines and comply with the requirements of the Tuross River Water Sharing Plan.</p> <p>This project is an existing NSW Government commitment.</p> <p>The project proposal has been approved by the Department of Planning, Industry and Environment and the NSW Government has contributed \$25.6 million (of a total \$105 million) towards design and construction. Eurobodalla Shire Council has applied to the Federal Government for 50% of the total cost of the project.</p>
<p>Intent</p>	<ul style="list-style-type: none"> • Increase water security for town water supplies. • Reduce competition for water during low flows.
<p>Challenges addressed</p>	<ul style="list-style-type: none"> • Lack of water security threatens town water supplies. • Lack of water security threatens the viability and growth of regional industries.
<p>Potential combinations</p>	<p>This option could be combined with other options focused on increasing water security for Eurobodalla Shire Council's southern water supply system.</p>
<p>Considerations</p>	<p>An advantage of the site of the proposed Eurobodalla Southern Storage is that the storage capacity could be increased in the future by raising the dam wall. Based on modelling, the capacity of the current proposal (3,000 ML) is expected to meet water demands for the next 30 years. Increasing the size of the storage to 8,000 ML is a feasible option in the longer term.</p> <p>Since the development of the study that identified this option, the NSW Government has invested in more detailed and sophisticated data and modelling methods. In particular:</p> <ul style="list-style-type: none"> • 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. <p>As a result, the benefits of this option may change when assessed against the updated models. This option requires a comprehensive environmental impact statement that includes, but is not necessarily limited to:</p> <ul style="list-style-type: none"> • assessment of potential impacts on cultural heritage sites • assessment of inundation impacts on landholders in the vicinity of the storage • assessment of changes to existing river flow patterns and planned environmental water • consideration of the distribution of benefits amongst consumptive water users and the environment • assessment of flow modifications or changed operational regime on connectivity including fish passage, native fish (including threatened species), ecological communities and ecosystems • assessment of how flow modifications may alter groundwater processes including groundwater recharge mechanisms and potential impacts on groundwater dependant ecosystems • review and amendments to the Tuross Water Sharing Plan. <p>This option would require assessment under the <i>Fisheries Management Act 1994</i>.</p> <p>Environmental assessment processes require sufficient scope to consider the cumulative impact of combined infrastructure options.</p>

Option 12. Eurobodalla Southern Storage (continued)

Objectives	
Further information	<p>www.planningportal.nsw.gov.au/major-projects/project/10111 www.esc.nsw.gov.au/inside-council/community-and-future-planning/strategies/integrated-water-cycle-management</p>



Option 13. Increased harvestable rights for coastal draining catchments

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

<p>Description</p>	<p>This option considers increasing the proportion of rainfall that can be captured in farm dams as a harvestable right, which is a form of basic landholder right.</p> <p>In recent years, some coastal landholders have requested that the NSW Government review its policy for harvestable water rights in coastal catchments. The argument put forward by these landholders is that because coastal catchments are shorter and experience higher rainfall than inland catchments, they are able to sustain a higher proportion of water being taken under harvestable rights.</p> <p>A review of harvestable rights is currently underway and is considering the benefits and impacts of increased harvestable rights and of allowing dams to be built on larger tributaries within NSW catchments that drain to the coast. The review aims to determine if greater access to water for agricultural ventures could be allowed while ensuring enough water is available for downstream water users and the environment.</p> <p>Undertaking this review is an existing NSW Government commitment.</p>
<p>Intent</p>	<ul style="list-style-type: none"> • Increase water security for industry. • Improve drought resilience of industry.
<p>Challenges addressed</p>	<p>Lack of water security threatens the viability and growth of regional industries.</p>
<p>Potential combinations</p>	<p>This option could be combined with other water efficiency and policy options, such as:</p> <ul style="list-style-type: none"> • Option 23. Establish sustainable extraction limits for South Coast surface water and groundwater sources • Option 24. Shift extractions from low streamflows to high streamflows • Option 34. Active and effective water markets. <p>It could also be combined with:</p> <ul style="list-style-type: none"> • Option 16. Increased on-farm water storage • Option 17. A grid of off-stream storages in the Bega Valley.
<p>Considerations</p>	<p>The review is considering the benefits of increasing harvestable rights for agricultural productivity as well as ancillary benefits such as additional water storage for firefighting. It is also considering potential impacts on river flows, water pricing, the environment and downstream water users such as water access licence holders and town water supplies. The review will also identify other options for improving water access that could be considered in conjunction with, or instead of, changing harvestable rights limits.</p>
<p>Objectives</p>	 
<p>Further information</p>	<p>www.industry.nsw.gov.au/water/licensing-trade/landholder-rights/harvestable-rights-dams</p>



Option 14. Improve releases from Cochrane Dam to better match water demands of irrigators

Source: Bega Valley Water Users Association

<p>Description</p>	<p>Cochrane Dam is an earthfill embankment dam on Georges Creek, a tributary of the Bemboka River. Cochrane Dam is owned and managed by Cochrane Dam Pty Ltd. The primary purpose of the dam is to store and release water for the generation of power at the Brown Mountain Hydro-electricity Power Plant. Water users downstream of the dam, including the village of Bemboka, benefit from the flow attenuation provided by Cochrane Dam.</p> <p>Cochrane Dam was constructed by the NSW Government during the late 1950s and was sold to Cochrane Dam Pty Ltd, a private consortium, in 2016. During the time that Cochrane Dam was owned and operated as a state asset, two key agreements existed between the dam operators and downstream water users, including:</p> <ul style="list-style-type: none"> • the Cochrane Dam Drought Reserve, which is now written into the <i>Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources 2011</i> • the ‘irrigation reserve’—the holding and releasing of water for irrigation purposes, which is now an agreement between Cochrane Dam Pty Ltd and the irrigators. <p>Operating the dam to optimise revenue from power generation while trying to accommodate the needs of downstream water users is challenging. However, there may be scope to define improved water release (and water take) arrangements that better meet these often conflicting needs. This option would explore what opportunities might exist to define such arrangements.</p> <p>The irrigation reserve was not written into the water sharing plan. Consistent with this, this option does not propose to prescribe any rules around water reservation and release arrangements for irrigation between Cochrane Dam Pty Ltd and water users.</p>
<p>Intent</p>	<ul style="list-style-type: none"> • Increase water security for industry. • Increase water security for town water supplies.
<p>Challenges addressed</p>	<ul style="list-style-type: none"> • Lack of water security threatens the viability and growth of regional industries. • Lack of water security threatens town water supplies.
<p>Potential combinations</p>	<p>This option could be combined with Option 20. Increase capacity of Cochrane Dam.</p>
<p>Considerations</p>	<p>The <i>Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources 2011</i> does not prescribe water sharing arrangements between Cochrane Dam Pty Ltd and water users on the Bemboka. Any such arrangements are between Cochrane Dam Pty Ltd and the water users but must comply with the general rules set out in the water sharing plan.</p> <p>The impacts of changes in the flow regime on the natural stream function would need to be assessed, including any off-setting measures.</p>
<p>Objectives</p>	

Option 15. Increased industry access to high flows

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

Description	<p>This option proposes to provide industry with increased access to high flows, including:</p> <ul style="list-style-type: none"> • supplementary flows in the Bega-Brogo regulated river system • high flows in unregulated catchments.
Intent	<ul style="list-style-type: none"> • Increase water security for industry. • Improve drought resilience of industry.
Challenges addressed	<p>Lack of water security threatens the viability and growth of regional industries.</p>
Potential combinations	<p>This option would be informed by Option 23. Establish sustainable extraction limits for South Coast surface water and groundwater sources.</p> <p>This option could be combined with:</p> <ul style="list-style-type: none"> • Option 13. Increased harvestable rights for coastal draining catchments • Option 16: Increased on-farm water storage • Option 17. A grid of off-stream storages in the Bega Valley.
Considerations	<p>This option should firstly consider the hydrologic impacts of increasing water access in unregulated coastal catchments. If such a study indicates that there is potential to increase water take without adversely impacting the environment or other water users, then the subsequent stage would be to assess various options that would allow an increased take of water. Increasing access to high streamflows would be one of these options.</p>
Objectives	 



Option 16. Increased on-farm water storage

Source: Community

<p>Description</p>	<p>Lack of water storage is a major constraint to balancing water supply and demands in South Coast catchments. This is a particular problem in the Bega and Tuross River catchments where higher volumes of entitlement have been issued for industry.</p> <p>This option would investigate the:</p> <ul style="list-style-type: none"> • current levels of farm dam implementation and usage • hurdles to constructing on-farm storages • value of on-farm storages to various industries in the South Coast region • regional consequences of low on-farm water security • risks to downstream water users and the environment from an increase in on-farm dams across the region. <p>On-farm water storage may assist in developing industry responses to emerging markets as they provide greater flexibility in access to water.</p>
<p>Intent</p>	<ul style="list-style-type: none"> • Increase water security for industry. • Improve drought resilience of industry.
<p>Challenges addressed</p>	<p>Lack of water security threatens the viability and growth of regional industries.</p>
<p>Potential combinations</p>	<p>This option would be informed by Option 23. Establish sustainable extraction limits for South Coast surface water and groundwater sources.</p> <p>This option could be combined with:</p> <ul style="list-style-type: none"> • Option 13. Increased harvestable rights for coastal draining catchments • Option 15. Increased industry access to high flows • Option 17. A grid of off-stream storages in the Bega Valley • Option 24. Shift extractions from low streamflows to high streamflows • Option 28. Fish-friendly water extraction • Option 40. River Recovery Program for the South Coast: a region-wide program of instream works, riparian vegetation and sediment control.
<p>Considerations</p>	<p>Bega Cheese Pty Ltd has recently submitted an application for a bushfire recovery grant to assist landholders to construct on-farm storages in the Bega Valley. Consultation with local water users and industry across the region will be required as part of the investigation.</p> <p>Farm dams will increase how much water is taken under water access licences and risks placing further pressure on rivers and streams already under hydrologic stress. Increasing on-farm storage is most attractive when considered in conjunction with options looking to shift extractive pressures from low streamflows to high streamflows, as it offers benefits to both extractive water users and river ecology. They can also reduce runoff to waterways, impacting water quality and ecosystem health. Geomorphic assessment would also need to be undertaken to ensure equilibrium bed slope and function to sustain natural stream processes are consistent with the objectives of the <i>Water Management Act 2000</i> and <i>Coastal Management Act 2016</i>.</p> <p>Dam safety requirements (<i>Dams Safety Act 2015</i>) would need to be assessed with consideration given to potential impacts on downstream flood risk associated with dam failure.</p>
<p>Objectives</p>	

Option 17. A grid of off-stream storages in the Bega Valley

Source: Bega Valley Water Storages Committee

<p>Description</p>	<p>In 2008, the Bega River Catchment Water Storages Project (Stage 1) investigated the feasibility of a range of water storage options for the Bega River catchment. The project was initiated by the Bega Valley Water Storages Committee, with representation from Bega Cheese, Bega Valley Water Users Association, Bega Valley Shire Council, Bega Environment Network, Southern Rivers Catchment Management Authority, Department of Water and Energy and Department of Primary Industries. SMEC was commissioned to conduct the investigations.</p> <p>The project concentrated on the Bega River catchment upstream of the Brogo River confluence. Both on-stream and off-stream storages were considered to enable extraction of the full licensed entitlement and increase the security and reliability of water supply. A total of 25 storage sites were identified and assessed.</p> <p>The project found that twelve off-stream storages with a total storage of 2,000 ML (less than 1% of the median annual end-of-system flow) would increase irrigation supply security to more than 90%.</p> <p>The option identified by this project proposed that the off-stream dams be filled by pumping flows from the nearest watercourse into the storage where flows would be stored until they are required by water users downstream. Flows would be extracted from the streams in accordance with the draft water sharing plan extraction rules assuming no limitations in pump transfer capacities. Once required, flows are released back into the streams from the off-stream storages where they are available for users to extract from the river.</p>
<p>Intent</p>	<ul style="list-style-type: none"> • Increase water security for industry. • Improve drought resilience of industry. • Reduce extractions from low streamflows. • Improve drought resilience of agricultural enterprises.
<p>Challenges addressed</p>	<ul style="list-style-type: none"> • Lack of water security threatens the viability of regional industries. • Sharing water equitably amongst all stakeholders.
<p>Potential combinations</p>	<p>This option would be informed by Option 23. Establish sustainable extraction limits for South Coast surface water and groundwater sources.</p> <p>This option could be combined with:</p> <ul style="list-style-type: none"> • Option 13. Increased harvestable rights for coastal draining catchments • Option 15. Increased industry access to high flows • Option 16. Increased on-farm water storage • Option 24. Shift extractions from low streamflows to high streamflows • Option 40. River Recovery Program for the South Coast: a region-wide program of instream works, riparian vegetation and sediment control.

Option 17. A grid of off-stream storages in the Bega Valley (continued)

<p>Considerations</p>	<p>Since the release of the SMEC report, water users have identified the costs of pumping as a potential hurdle and have proposed that catchment harvesting dams be used in preference. Storing water high in the catchment will allow gravity-fed irrigation rather than pumping from a stream and then again from a storage. The use of “smart” culverts on feeder drains (that is, a through-pipe along the feeder drain to the storage set in a culvert-well, with its inlet below that of a high-flow culvert pipe relieving the feeder drain) can obviate the need for a concrete spillway on the storage and greatly increase the effective catchment area.</p> <p>To store water flowing in large events in on-stream dams requires expensive engineering and well-designed spillways. The proposal for smaller dams throughout the catchment, preferably filled by feeder drains with “smart” culverts, could be quite cost-effective compared to the option of large instream dams.</p> <p>Although the operation and management of a network of dams would be problematic, this option has considerable community support across a range of stakeholders including water users and those representing environmental interests. Ownership of the land on which new storages are constructed is critical for this option. Any change in ownership could complicate the initiative enormously.</p> <p>No single storage option in the Bega Valley can meet all the requirements for irrigation, town water or riparian and stock water, due to the dispersed location of water users throughout the catchment. A range of options needs to be considered to ensure adequate supply reliability (SMEC 2008).</p> <p>Dam safety requirements (<i>Dams Safety Act, 2015</i>) would need to be assessed with consideration to potential impacts on downstream flood risk associated with dam failure.</p> <p>This option would require assessment under the <i>Fisheries Management Act 1994</i>.</p> <p>An assessment of how flow modifications may alter groundwater process including groundwater recharge mechanisms and influence any groundwater dependant ecosystems would also be necessary.</p> <p>Geomorphic assessment would also need to be undertaken to ensure equilibrium bed slope and function to sustain natural stream processes are consistent with the objectives of the <i>Water Management Act 2000</i> and <i>Coastal Management Act 2016</i>.</p>
<p>Objectives</p>	
<p>Further information</p>	<p>SMEC 2008, <i>Bega River Catchment Water Storage Project</i>, SMEC.</p>

Option 18. Tuross River barrage

Source: Community

<p>Description</p>	<p>Saltwater ingress into the lower reaches of coastal streams presents challenges for extractive water use (irrigation, domestic water and stock water). This challenge is particularly relevant on the lower Tuross River where the majority of the valley's dairy farms are located. On average, every four to five years, as a consequence of saltwater ingress, river salinity increases to levels that are unsuitable for stock. With projected rises in sea level, the severity and/or frequency of saltwater ingress into the lower reaches of the Tuross River is expected to increase.</p> <p>To manage the risk of saltwater ingress in the lower Tuross, landholders have, on occasions when river salinity is approaching harmful levels, built a temporary sand barrage across the river at the tidal limit. The barrage is of a temporary nature and washes away with the natural flow of the river; however, concerns have been raised regarding the effect of the structure on the river and its ecosystem. In recent years, a temporary fishway was installed in the barrage to mitigate the impacts on fish travelling up and down the river.</p> <p>This option would assess the costs and benefits (environmental, economic and social) of several options, such as the continuing use of a temporary sand barrage, the installation of a permanent weir or options that reduce landholders' demands on water from the lower Tuross (bores put down by landholders and Eurobodalla Shire Council investigations suggest that there are limited readily accessible groundwater resources in the area).</p>
<p>Intent</p>	<p>Increase water security for industry.</p>
<p>Challenges addressed</p>	<ul style="list-style-type: none"> • Sea level rise threatens agricultural industries. • Lack of water security threatens the viability and growth of regional industries.
<p>Potential combinations</p>	<p>This option could be combined with:</p> <ul style="list-style-type: none"> • Option 7. Vulnerability of surface water supplies to sea level rise • Option 8. Reuse of reclaimed water • Option 29. Improved fish passage in South Coast rivers • Option 40. River Recovery Program for the South Coast: a region-wide program of instream works, riparian vegetation and sediment control.
<p>Considerations</p>	<p>This option would require assessment under the <i>Fisheries Management Act 1994</i> and would also require water supply works approval under the <i>Water Management Act 2000</i>.</p>
<p>Objectives</p>	
<p>Further information</p>	<p>Dedden 2010, <i>Sustainable water use in the lower Tuross River</i>. A thesis completed as partial fulfillment of the requirements for the award of Honours Bachelor of Environmental Science.</p>



Option 19. Increase capacity of Brogo Dam

Source: WaterNSW

<p>Description</p>	<p>In most years, start of season and end of season water allocations from Brogo Dam are relatively low, which restricts the level of investment in regional industry. The low level of allocations is due in part to the high level of entitlement (15,000 ML) relative to the dam capacity (8,920 ML).</p> <p>Increasing the capacity of Brogo Dam would be one way of addressing the high proportion of entitlement to dam volume.</p> <p>This option would improve water reliability and start of year allocations for general security water access licence holders, which could give irrigators improved confidence in investing in their farming practices. This could directly impact on production and promote growth and diversification in the region's agricultural sector.</p> <p>Increasing the revenue of Brogo Dam and reducing the level of government subsidy is a longstanding issue that WaterNSW and the NSW Government are endeavouring to address.</p> <p>WaterNSW has discussed the option of increasing the capacity of Brogo Dam with customers through its level of service meetings. WaterNSW has reported that some Brogo irrigators and Bega Cheese Pty Ltd are interested in this option being investigated.</p>
<p>Intent</p>	<ul style="list-style-type: none"> • Increase water security for industry. • Improve the financial operation of Brogo Dam. • Increase water security for agricultural enterprises.
<p>Challenges addressed</p>	<ul style="list-style-type: none"> • Lack of water security threatens the viability and growth of regional industries. • Lack of water security threatens town water supplies.
<p>Potential combinations</p>	<p>This option could be combined with:</p> <ul style="list-style-type: none"> • Option 1. Pipeline from Brogo Dam to Bega-Tathra town water supply system • Option 2. A reserve volume for the Brogo-Bermagui town water supply system • Option 3. Water treatment plant for Brogo-Bermagui town water supply system • Option 6. Pipeline connecting Bega Valley Shire Council and Eurobodalla Shire Council water supply systems • Option 7. Vulnerability of surface water supplies to sea level rise • Option 36. Weir at Brogo-Bermagui town water supply off-take • Option 37. Shorten the Bega-Brogo regulated river system • Option 38. Increase general security allocations in the Bega-Brogo regulated river system.

Option 19. Increase capacity of Brogo Dam (continued)

<p>Considerations</p>	<p>In 2004, State Water prepared a preliminary study into the augmentation of Brogo Dam, with cost estimates for several augmentation options. Hydrological modelling is required to confirm the optimal size of augmentation, which would then allow a preliminary design and costing. Hydrologic modelling would also be required to understand the hydrologic impacts of any proposed augmentation.</p> <p>Before progressing this option too far, it would be prudent to thoroughly investigate the potential demand for the increased volume of regulated water. Brogo Dam is currently operating at a financial loss. A very strong argument would need to be developed to explore how augmenting Brogo Dam would allow this regulated system to become profitable. WaterNSW suggests that increasing the capacity of the dam may allow for new streams of income such as additional high security allocations or town water supplies in addition to enhancing the level of reliability for existing customers. It has also been suggested that an augmented Brogo Dam could also open up opportunities for the installation of a hydropower plant. A larger Brogo Dam could also play a key role in managing salt intrusion as a result of sea level rise and contribute to held environmental water needs.</p> <p>Bega Valley Shire Council has indicated that its current entitlement from Brogo Dam is sufficient to meet Bermagui's future demands. If the level of town water security provided by the Bega Sands water source is shown to be of concern following an investigation into the risks of saltwater intrusion, then an augmented Brogo Dam may offer some possibilities to supply water to the Bega-Tathra town water supply system. It could also be considered as a means of helping facilitate growth in the region.</p> <p>This option would require:</p> <ul style="list-style-type: none"> • assessment of potential impacts on cultural heritage sites • assessment of inundation impacts on public and private land • assessment of changes to existing river flow patterns and planned environmental water • assessment of cold-water pollution impacts • consideration of the distribution of benefits amongst consumptive water users and the environment • assessment of flow modifications on water quality from reduced freshes or moderate flows, and high flow events • assessment of flow modifications or changed operational regime on connectivity including fish passage, native fish (including threatened species), ecological communities and ecosystems • assessment of the impacts of changes of the flow regime on the natural stream function including any off-setting measures • assessment of how flow modifications may alter groundwater processes including groundwater recharge mechanisms and potential impacts on groundwater dependant ecosystems • review and amendments to the <i>Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources 2011</i>. <p>This option would require assessment under the <i>Fisheries Management Act 1994</i>.</p> <p>Environmental assessment processes require enough scope to consider the cumulative impact of combined infrastructure options.</p>
<p>Objectives</p>	
<p>Further information</p>	<p>State Water 2004, Brogo Dam Augmentation Preliminary Study WaterNSW's 20-year Infrastructure Options Study: www.waterrns.com.au/projects/infrastructure-studies/20-year-infrastructure-options-study</p>



Option 20. Increase capacity of Cochrane Dam

Source: Cochrane Dam Pty Ltd

Description	This option would increase the capacity of Cochrane Dam by raising the height of the current dam wall.
Intent	<ul style="list-style-type: none"> • Increase water security for industry. • Improve drought resilience of industry.
Challenges addressed	Lack of water security threatens the viability and growth of regional industries.
Potential combinations	<p>This option could be combined with:</p> <ul style="list-style-type: none"> • Option 14. Improve releases from Cochrane Dam to better match the water demands of irrigators • Option 23. Establish sustainable extraction limits for South Coast surface water and groundwater sources.
Considerations	<p>Raising the dam wall would inundate areas of the South East Forests National Park and would be subject to stringent environmental assessment.</p> <p>It would also require:</p> <ul style="list-style-type: none"> • assessment of potential impacts on cultural heritage sites • assessment of inundation impacts on landholders in the vicinity of the storage • assessment of changes to existing river flow patterns and planned environmental water • assessment of cold water pollution impacts • consideration of the distribution of benefits amongst consumptive water users and the environment • assessment of flow modifications on water quality from reduced freshes or moderate flows, and high flow events • assessment of flow modifications or changed operational regime on connectivity including fish passage, native fish (including threatened species), ecological communities and ecosystems • assessment of the impacts of changes of the flow regime on the natural stream function including any off-setting measures • assessment of how flow modifications may alter groundwater processes including groundwater recharge mechanisms and potential impacts on groundwater dependant ecosystems • review and amendments to the <i>Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources 2011</i>. <p>This option would require assessment under the <i>Fisheries Management Act 1994</i>.</p> <p>Environmental assessment processes require sufficient scope to consider the cumulative impact of combined infrastructure options.</p>
Objectives	

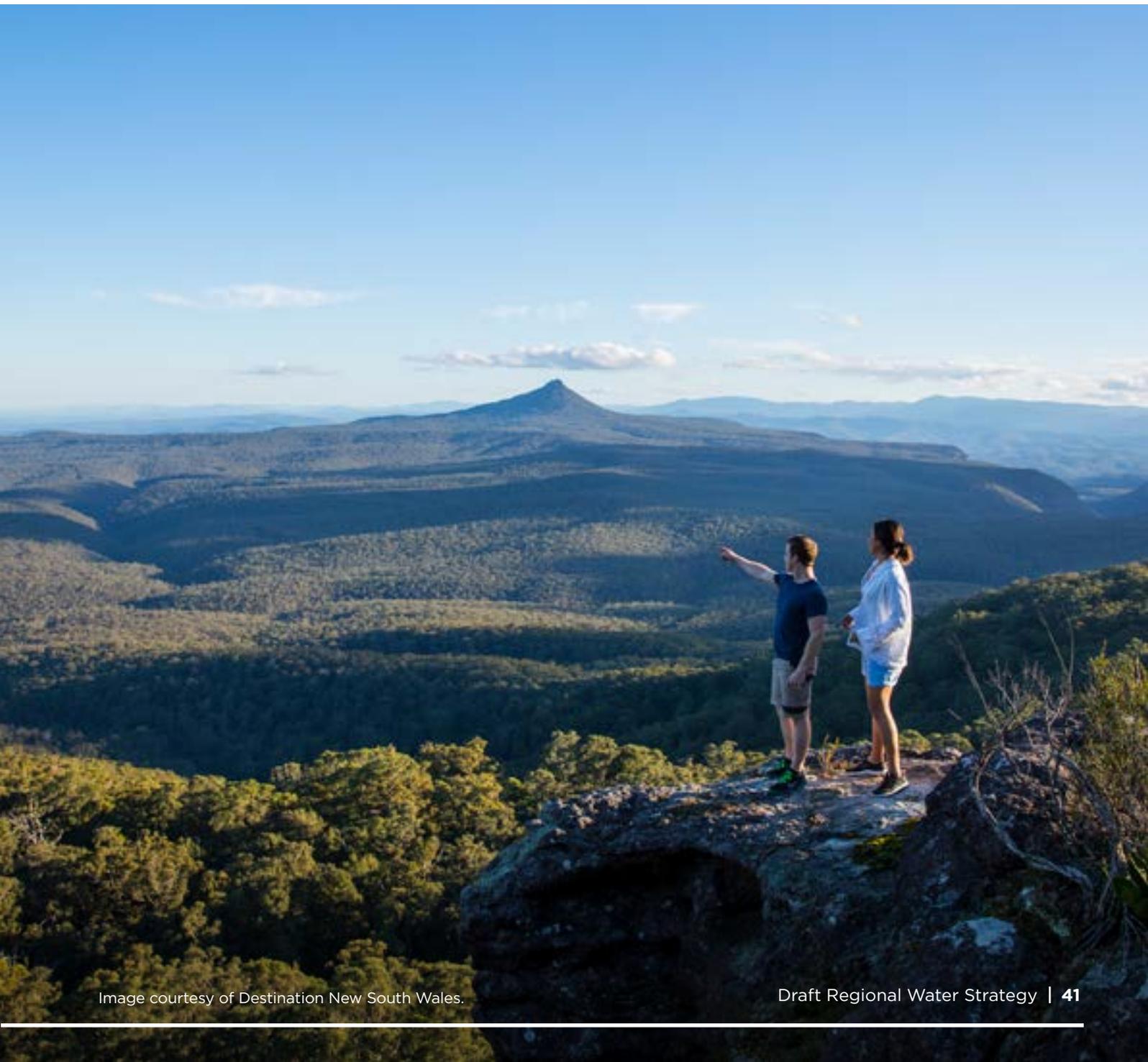
Option 21. Brown Mountain Water Project (pumped hydro scheme)

Source: Cochrane Dam Pty Ltd

<p>Description</p>	<p>This option would increase water storage for the Bega Valley by pumping water during high stream flows from a pondage below the existing Brown Mountain Power Station to a new water storage (nominally 40 GL) located at Steeple Flat in the headwaters of the Bemboka River.</p> <p>This option (as proposed by Cochrane Dam Pty Ltd) is based on the NSW Government owning the Steeple Flat storage and Cochrane Dam Pty Ltd owning and operating the pumped hydro infrastructure.</p> <p>Cochrane Dam Pty Ltd would generate power on a run-of-river basis between Steeple Flat and Cochrane Dam using two 50 MW generators. A pumped hydro scheme would recycle the water contained in Cochrane Dam (approximately 2.4 GL).</p>
<p>Intent</p>	<ul style="list-style-type: none"> • Increase water security for industry. • Improve drought resilience of industry.
<p>Challenges addressed</p>	<p>Lack of water security threatens the viability and growth of regional industries.</p>
<p>Potential combinations</p>	<p>This option could be combined with:</p> <ul style="list-style-type: none"> • Option 14. Improve releases from Cochrane Dam to better match the water demands of irrigators • Option 23. Establish sustainable extraction limits for South Coast surface water and groundwater sources.
<p>Considerations</p>	<p>Assessing this option is complex as it not only addresses water security issues, it must also be assessed against parameters relating to NSW's power supply.</p> <p>Through the <i>NSW Pumped Hydro Roadmap</i>, the NSW Government supports sensible, private development of new off-river, closed-loop pumped hydro infrastructure. The government is encouraging the private sector to share the load of our future energy needs. This option may also potentially align with the aims of the <i>NSW Electricity Strategy</i> for a reliable, affordable and sustainable electricity source that supports a growing economy.</p> <p>The hydrological impacts of this option would need to be well understood before it advanced too far. Hydrologic modelling of numerous configurations and operational rules would need to be considered and, in particular, an analysis undertaken of the distribution of costs and benefits across all stakeholders.</p> <p>The successful design, construction and ongoing operation of this option would require detailed and extensive discussions and negotiations with numerous stakeholders.</p> <p>The new storage would also require:</p> <ul style="list-style-type: none"> • assessment of potential impacts on cultural heritage sites • assessment of inundation impacts on landholders in the vicinity of the storage • assessment of changes to existing river flow patterns and planned environmental water • assessment of cold-water pollution impacts • consideration of the distribution of benefits amongst consumptive water users and the environment • assessment of flow modifications on water quality from reduced freshes or moderate flows, and high flow events • assessment of flow modifications or changed operational regime on connectivity including fish passage, native fish (including threatened species), ecological communities and ecosystems • review and amendments to the <i>Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources 2011</i>. <p>This option would require assessment under the <i>Fisheries Management Act 1994</i>.</p> <p>Environmental assessment processes require enough scope to consider the cumulative impact of combined infrastructure options.</p>

Option 21. Brown Mountain Water Project (pumped hydro scheme)

Objectives	
Further information	<p>NSW Electricity Strategy: energy.nsw.gov.au/government-and-regulation/electricity-strategy</p> <p>NSW Pumped Hydro Roadmap: energy.nsw.gov.au/renewables/clean-energy-initiatives/hydro-energy-and-storage</p>



Option 22. Instream dam at Crystalbrook

Source: Bega Valley Water Storages Committee

Description	<p>The Bega River Catchment Water Storages Project (Stage 1) investigated the feasibility of a range of water storage options for the Bega River catchment (refer to Option 17). The project included options for constructing an instream dam (5 GL or 24 GL) at Crystalbrook on Brown Mountain Creek. Hydrologic modelling as part of this project indicated that a 5 GL dam at Crystalbrook would provide 80% reliability to irrigators on the Bega-Bemboka River, while a 24 GL dam would provide 90% reliability.</p>
Intent	<ul style="list-style-type: none"> • Increase water security for industry. • Improve drought resilience of industry. • Reduce extractions from low streamflows.
Challenges addressed	<p>Lack of water security threatens the viability and growth of regional industries.</p>
Potential combinations	<p>This option could be combined with:</p> <ul style="list-style-type: none"> • Option 15. Increased industry access to high flows • Option 16. Increased on-farm water storage • Option 24. Shift extractions from low streamflows to high streamflows • Option 40. River Recovery Program for the South Coast: a region-wide program of instream works, riparian vegetation and sediment control.
Considerations	<p>Since the SMEC study, the NSW Government has invested in more detailed and sophisticated data and modelling methods. In particular:</p> <ul style="list-style-type: none"> • 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. <p>As a result, the benefits of this option may change when assessed against the updated models. This option requires:</p> <ul style="list-style-type: none"> • assessment of potential impacts on cultural heritage sites • assessment of inundation impacts on landholders in the vicinity of the storage • assessment of changes to existing river flow patterns and planned environmental water • assessment of cold water pollution impacts • consideration of the distribution of benefits amongst consumptive water users and the environment • assessment of flow modifications on water quality from reduced freshes or moderate flows, and high flow events • assessment of flow modifications or changed operational regime on connectivity including fish passage, native fish (including threatened species), ecological communities and ecosystems • assessment of flow modifications on riparian vegetation, Endangered Ecological Communities and stream geomorphology, including recovery of vegetation from bank full/channel forming events • assessment of the impacts of changes of the flow regime on the natural stream function including any off-setting measures • review and amendments to the <i>Water Sharing Plan for the Bega and Brogo Rivers Area Regulated, Unregulated and Alluvial Water Sources 2011</i>. <p>This option would require assessment under the <i>Fisheries Management Act 1994</i>.</p> <p>Environmental assessment processes require sufficient scope to consider the cumulative impact of combined infrastructure options.</p>
Objectives	
Further information	<p>SMEC 2008, Bega River Catchment Water Storage Project, SMEC.</p>



Protecting and enhancing natural systems

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

Option 23. Establish sustainable extraction limits for South Coast surface water and groundwater sources

Source: Department of Planning, Industry and Environment—Water

<p>Description</p>	<p>Water sharing plans set the long-term average annual extraction limit (LTAAEL) for surface water and groundwater sources. In most cases, surface water and most groundwater LTAAELs for coastal valleys were set at the sum of existing entitlement, and some groundwater LTAAELs were calculated based on an estimated percentage of groundwater recharge.</p> <p>With the remake of water sharing plans and improved information, there is scope to redefine LTAAELs based on ecological, economic, social and cultural water needs.</p> <p>This option would:</p> <ul style="list-style-type: none"> investigate methods for defining sustainable levels of extraction based on ecological, economic, social and cultural water needs investigate the level of security of the existing groundwater sources to meet town water supply system demands quantify the sustainable extraction volumes for surface water and groundwater sources in the South Coast at different temporal and hydrological scales based on best available science and understanding of surface water and groundwater processes and knowledge of social and economic impacts consider amending water sharing plans to legally establish new limits on surface water and groundwater extraction that reflect sustainable levels develop a strategy for the controlled allocation of surface water for the South Coast if the study identifies available unassigned water review and, if necessary, update the strategy for the controlled allocation of groundwater if the study identifies changes to existing LTAAELs. <p>This option focuses on water sources that are under the greatest extractive pressure—the Bega and Tuross catchments for surface water and Bega Sands, Towamba Alluvium and Tuross Alluvium for groundwater.</p>
<p>Intent</p>	<ul style="list-style-type: none"> Improve our understanding of coastal river systems and aquifers and their sustainable extraction limits. Set extraction limits that optimise production and maintain natural ecosystems. Facilitate access to water for productive use where available. Ensure sustainable access to groundwater by both consumptive water users and the environment.
<p>Challenges addressed</p>	<ul style="list-style-type: none"> Sharing water equitably among all stakeholders. Lack of water security impacts upon environmental assets.
<p>Potential combinations</p>	<p>This option would underpin or inform all options relating to increased access to water for any extractive or non-extractive use.</p>

Option 23. Establish sustainable extraction limits for South Coast surface water and groundwater sources (continued)

<p>Considerations</p>	<p>Stating sustainable, volumetric extraction limits in water sharing plans is a recurring recommendation of the Natural Resources Commission in its reviews of coastal water sharing plans. The National Water Initiative also suggests that governments have a responsibility to ensure water is allocated and used to achieve socially and economically beneficial outcomes in a manner that is environmentally sustainable.</p> <p>Extraction limits would need to account for climate change because as the climate changes, the volumes of water that can be extracted sustainably may also change. Other consequences of climate change, such as saltwater ingress to coastal aquifers, would also need to be considered. Further investigations may be required to gain a better understanding of these risks.</p> <p>There are challenges in administering daily extraction limits (such as total daily extraction limits and individual daily extraction limits) due to the lack of metering infrastructure.</p> <p>Extraction limits would need to consider differentiating between types of unregulated water access entitlements. For example, licences to extract low flows are currently treated the same as licences linked to harvesting farm dams that have low-flow bypasses. This is an issue in the Dry River catchment where the total volume of licensed entitlement is close to the current extraction limit even though much of the entitlement is tied up in farm dams with low-flow by-passes. These farm dams are likely to have a lesser impact on low flows than a licence to extract from the river during these periods.</p> <p>Establishing a sustainable LTAAEL would also need to occur in parallel with a review of trade rules. This is because the trade-in volume will need to align with the defined LTAAELs.</p>
<p>Objectives</p>	
<p>Further information</p>	<p>Controlled allocations: www.industry.nsw.gov.au/water/allocations-availability/controlled</p>

Option 24. Shift extractions from low streamflows to high streamflows

Source: Community

<p>Description</p>	<p>Water demand for crops and pastures is usually greatest when streamflows are low and under greatest hydrologic stress. Removing water extraction when streamflows are low reduces the risk of poor water quality and threats to riverine ecosystems during these periods.</p> <p>Water sharing plans in the South Coast region allow for the conversion of unregulated licences to 'high flow access only' licences. However, this option has not been taken up by licence holders. One reason for this is likely to be the expenses associated with constructing off-stream storages and 'double pumping', which involves pumping water into a storage during times of medium to high flow and pumping water from the storage to irrigate during times of high water demand. Another factor is that licence holders are very hesitant to give up water entitlements that give them access to more regular streamflows.</p> <p>This option would investigate more closely why high flow conversions have not been taken up and if there are other incentives that may be more effective.</p>
<p>Intent</p>	<ul style="list-style-type: none"> • Increase water security for industry. • Improve drought resilience of industry. • Reduce extractions from low streamflows. • Improve water quality in watercourses.
<p>Challenges addressed</p>	<ul style="list-style-type: none"> • Lack of water security threatens the viability and growth of regional industries. • Major rivers in the region are under hydrologic stress. • Protecting native and threatened aquatic species.
<p>Potential combinations</p>	<p>This option could be combined with:</p> <ul style="list-style-type: none"> • Option 13. Increased harvestable rights for coastal draining catchments • Option 16. Increased on-farm water storage • Option 17. A grid of off-stream storages in the Bega Valley • Option 23. Establish sustainable extraction limits for South Coast surface water and groundwater sources • Option 31. Bringing back riverine and estuarine habitats and threatened species • Option 40. River Recovery Program for the South Coast: a region-wide program of instream works, riparian vegetation and sediment control.
<p>Considerations</p>	<p>To maintain the reliability of existing water access licences, options that aim to shift extractive pressures from low streamflows to high streamflows require water storage. On-farm water storage allows water to be taken during medium and high flows rather than during low flows. This provides benefits to river ecology and can provide a greater level of security to farmers.</p> <p>Water users have indicated that the current low to high flow water access licence conversion rates of 2.5 and 5 are not sufficient to justify the additional expenses of constructing on-farm storage and double-pumping. These conversion rates aim to achieve a balance between providing incentives for water users to convert to high flow and providing significant ecological benefits. If the conversion rate is too high, the additional extractive pressure on high flows may outweigh the ecological gains of reduced extractions from low flows.</p> <p>In catchments where basic landholder rights and/or stock and domestic licences represent a large proportion of water extracted, it may be worth considering incentives that encourage these water users to reduce extractions during periods of low streamflow.</p>
<p>Objectives</p>	

Option 25. Extend water and sewer services to southern villages (Shoalhaven Water)

Source: Shoalhaven Water

Description	This option would provide water and sewer services to villages south of Lake Tabourie, including Kioloa, Merry Beach Bawley Point and North Durras.
Intent	<ul style="list-style-type: none"> • Protect water resources (coastal lakes and aquifers) from septic pollution. • Increase water security for town water supplies.
Challenges addressed	Protecting water resources (coastal lakes and aquifers) from pollution.
Potential combinations	This option could be combined with options targeting improvements to water quality and public health.
Considerations	<p>There is no evidence that the lack of sewerage systems for these villages is having an unacceptable impact on the local waterways. Council's decision about whether to connect these villages to town water supply and sewerage services will be driven by community interest. To date, these communities have not expressed any considerable interest in being connected to mains water and sewer.</p> <p>Any connection to North Durras would likely be completed with Eurobodalla Shire Council connecting in South Durras. In light of the distance that water would need to be piped to service the southern villages, maintaining residual chlorine levels would be a challenge. Shoalhaven Water are currently trialling the use of chlorine tablets.</p>
Objectives	

Option 26. Southern Reclaimed Water Management Scheme

Source: Shoalhaven Water

<p>Description</p>	<p>Shoalhaven Water’s Reclaimed Water Management Scheme (REMS) was commissioned in January 2002. Fourteen dairy farms, two golf courses and several sporting grounds on the Shoalhaven floodplain now irrigate with reclaimed water from the scheme on well over 500 ha of land.</p> <p>In 2008, GHD was engaged by Shoalhaven Water to carry out investigations into the feasibility of a reclaimed water re-use scheme for the Milton-Ulladulla area (a ‘Southern REMS’). This study investigated the viability of reclaimed water re-use as part of the integrated management of water resources in the Milton-Ulladulla area.</p> <p>The study found that a re-use scheme for Milton-Ulladulla Sewerage is technically feasible and could provide a reliable supply for around 85 ha of land using current sewage treatment plant outflows or up to 220 ha if seasonal balancing storage of some 237 ML were to be included in the scheme. This would include 30 ha of land within the Mollmook Golf Course currently using storm water for irrigation purposes.</p> <p>Some re-use occurs on a sports field but the treated effluent is discharged via an extended outfall 300 m off Racecourse Beach near Ulladulla.</p>
<p>Intent</p>	<ul style="list-style-type: none"> • Protect water resources (coastal lakes and aquifers) from effluent discharges. • Increase water security for agricultural enterprises. • Off-set the use of reticulated water for irrigating golf courses and playing fields.
<p>Challenges addressed</p>	<ul style="list-style-type: none"> • Protecting water resources (coastal lakes and aquifers) from pollution. • Lack of water security threatens the viability and growth of regional industries.
<p>Potential combinations</p>	<p>This option could be combined with options targeting improvements to water quality and public health and water access reliability for local industries in the Milton-Ulladulla region.</p>
<p>Considerations</p>	<p>GHD recommended that council do not pursue the Southern REMS on the basis of high capital and equivalent unit costs of producing the water, uncertainties in the long-term market for such a scheme and also in consideration of preserving this water resource for future indirect potable replacement purposes to achieve net social, economic and environmental benefits.</p> <p>The existing REMS on the Shoalhaven floodplain has shown significant and growing demand for reclaimed water. The operating costs for a Southern REMS would be relatively low; however, Shoalhaven Water has identified that government funding would be required to cover the high capital costs.</p> <p>Priority should be given to coastal management program areas where sewerage overflows are identified as creating a threat to waterway and estuary health.</p>
<p>Objectives</p>	

Option 27. Merimbula Effluent Management Scheme

Source: Bega Valley Shire Council

<p>Description</p>	<p>Bega Valley Shire Council currently reuses about a quarter of the recycled water produced at Merimbula Sewage Treatment Plant for irrigation at Pambula-Merimbula Golf Club and Oaklands Farm. The amount of reuse varies according to rainfall and in years of high rainfall, these sites need less irrigation. As a consequence of climate, existing land use and topography, it is not possible to reuse all of the recycled water produced by the Merimbula Sewage Treatment Plant.</p> <p>Council discharges excess recycled water through a beach-face outfall pipe on Merimbula Beach or into an area of the dunes. The area uses is significant to the local Aboriginal community and is also endangered Bangalay Sand Forest—a community of over 50 endemic species including eucalypt, banksia, dianella and dichondra.</p> <p>The NSW Environment Protection Authority has instructed Council to upgrade the sewage treatment plant and construct an ocean outfall to dispose of excess recycled water during high rainfall periods. Upgrades to the plant will also improve the quality of its recycled water. The Merimbula Sewage Treatment Plant and Ocean Outfall Project, which has been thoroughly investigated over the past 10 years, aims to protect the area's unspoilt aquatic and land environment and ensure public health standards are met.</p>
<p>Intent</p>	<p>Protect the area's unspoilt aquatic and land environment and ensure public health standards are met.</p>
<p>Challenges addressed</p>	<p>Protecting water resources (coastal lakes and aquifers) from pollution.</p>
<p>Potential combinations</p>	<p>This option could be combined with options targeting improvements to water quality and public health in the Merimbula region.</p>
<p>Considerations</p>	<p>There is some community opposition to the project. In December 2017, the Community Working Group started working with AECOM (specialist environmental consultants) to consider how the sewage treatment plant will be upgraded and the most appropriate alignment for the ocean outfall.</p> <p>An Environmental Impact Statement for the proposed scheme is currently being prepared.</p> <p>The NSW Government has committed 25% funding to this project under the Safe and Secure Water Program should it proceed. The total cost of the project is \$40 million.</p> <p>The option would need to consider the requirements of the <i>State Environmental Planning Policy No 62—Sustainable Aquaculture</i>.</p>
<p>Objectives</p>	
<p>Further information</p>	<p>Bega Valley Shire Council Merimbula Sewage Treatment Plant Upgrade: begavalley.nsw.gov.au/cp_themes/default/page.asp?p=DOC-ONG-54-47-20#.X2hlw_jCy4c.google</p> <p>NSW Government Planning Portal Merimbula Sewage Treatment Plant: www.planningportal.nsw.gov.au/major-projects/project/10641</p>

Option 28. Fish-friendly water extraction

Source: Department of Primary Industries—Fisheries

<p>Description</p>	<p>This option would require the installation of screens on pumps channels to reduce the amount of fish being extracted at pump sites.</p> <p>Native fish can be inadvertently extracted by pumps. From there, the fish are unable to return to the river system. Addressing fish extraction with diversion screening has benefits both for the environment and for pump owners/operators by mitigating blockages caused by debris. This improves water delivery and extraction efficiency and results in on-farm cost savings.</p> <p>The 'Screens for Streams' program will partner extractive water users with scientists and engineers to collaboratively reduce native fish mortality. This option for diversion screening will target high priority reaches or installations in the South Coast region.</p>
<p>Intent</p>	<p>Reduce the loss of native fish from the in the South Coast region while improving water delivery and extraction efficiency.</p>
<p>Challenges addressed</p>	<p>Protecting native and threatened aquatic species.</p>
<p>Potential combinations</p>	<p>This option could be combined with:</p> <ul style="list-style-type: none"> • Option 16. Increased on-farm water storage • Option 23. Establish sustainable extraction limits for South Coast surface water and groundwater sources • Option 31. Bringing back riverine and estuarine habitats and threatened species • Option 40. River Recovery Program for the South Coast: a region-wide program of instream works, riparian vegetation and sediment control.
<p>Considerations</p>	<p>Diversion screening has the following benefits for the community, pump owners and the environment:</p> <ul style="list-style-type: none"> • it prevents entrainment of adults, larvae and eggs, thereby reducing fish mortalities and supporting population growth. Research by Department of Primary Industries—Fisheries in 2013 found that well designed and installed screens can reduce fish deaths by up to 90%, as well as mortalities for other biota • pump owners save money as a result of reduced costs for fuel and electricity, filters and maintenance. These funds are then available to reinvest in other areas of their business • screens improve water delivery and extraction efficiency through reduced debris blockages • demand for screens provides a boost for manufacturing and retail sectors • screening will deliver ecological outcomes to support regional water strategy objectives without requiring additional water allocations. <p>The program would require:</p> <ul style="list-style-type: none"> • assessment of the cost-benefits of screening, including environmental outputs, water delivery efficiency and long-term social and financial implications to water licence holders • assessment of incentive schemes for landholders to install screens. <p>If the screens are a legislative requirement, a mandatory condition for applicable works approvals may need to be included in the relevant water sharing plans. This would enable enforcement and monitoring of presence/absence of the devices.</p> <p>Note: Diversion screens have been used successfully for decades overseas (for example, in western USA, Europe and New Zealand).</p>
<p>Objective</p>	

Option 29. Improved fish passage in South Coast rivers

Source: Department of Primary Industries—Fisheries

<p>Description</p>	<p>Barriers to fish passage are a major contributor to the decline of native fish species. Reflecting this, they are listed as a key threatening process in State and Commonwealth threatened species legislation. The <i>NSW Fish Passage Strategy</i> aims to address the highest priority fish barriers remaining in NSW, including the replacement or remediation of six high priority fish barriers in the South Coast region: Buckenbowra Dam, Currowan Creek-Western Distributor, Shallow Crossing, Clyde Ridge Road, Burra Creek Weir and Wadbilliga Road.</p> <p>Remediating these structures will:</p> <ul style="list-style-type: none"> • improve the ability of native and threatened species 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 • improve growth and survivorship of native and threatened fish species. <p>The <i>NSW Fish Passage Strategy</i> is scheduled to be carried out over multiple phases.</p>
<p>Intent</p>	<ul style="list-style-type: none"> • Maintain and improve native fish access to core habitat in the South Coast region. • Improve fish movement through fishways and encourage breeding and spawning activities, especially for threatened species. • Improve recreational and cultural fishing and regional tourism opportunities.
<p>Challenges addressed</p>	<ul style="list-style-type: none"> • Dams and other water delivery infrastructure alter natural flow regimes which impacts on water quality, native species and ecosystems. • Climate variability and change will place increased pressure on surface and groundwater resources and the ecosystems they support.
<p>Potential combinations</p>	<p>This option could be combined with:</p> <ul style="list-style-type: none"> • Option 18. Tuross River barrage • Option 23. Establish sustainable extraction limits for South Coast surface water and groundwater sources • Option 24. Shift extractions from low streamflows to high streamflows • Option 31. Bringing back riverine and estuarine habitats and threatened species • Option 36. Weir at Brogo-Bermagui town water supply off-take • Option 40. River Recovery Program for the South Coast: a region-wide program of instream works, riparian vegetation and sediment control.
<p>Considerations</p>	<p>Many native fish species in the South Coast region 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.</p> <p>Suitable environmental water management settings need to be in place to secure hydrological connectivity between connected river reaches. Fish passage remediation can only assist in mitigating the impact of barriers to fish passage in hydrologically connected systems.</p> <p>Local water utility and water user access requirements will need to be considered in the design of new fishway structures to ensure reliability of supplies are not negatively impacted or are offset.</p>
<p>Objective</p>	
<p>Further information</p>	<p>www.dpi.nsw.gov.au/fishing/habitat/threats/barriers</p> <p>www.marine.nsw.gov.au/strategy-implementation/delivering-healthy-coastal-habitats-with-sustainable-use-and-development/re-connecting-fish-habitats</p>

Option 30. Improve stormwater management

Source: Department of Planning, Industry and Environment—Water

<p>Description</p>	<p>Stormwater is runoff generated from rain falling on impervious surfaces. This option will consider the possibility of precinct-scale schemes to harvest and reuse stormwater in new urban developments. This involves harvesting, storing, treating and delivering stormwater for non-potable use such as the irrigation of local parks or playing fields.</p> <p>In addition to providing an alternative water source, stormwater schemes can also provide environmental benefits by improving the quality of stormwater discharges to waterways, reducing localised flooding and improving public amenity.</p> <p>This option will investigate what benefits a regional approach may bring to stormwater management.</p>
<p>Intent</p>	<p>Increase resilience of the regional water supply and improve water quality and local flood risk management, through improved stormwater management.</p>
<p>Challenges addressed</p>	<ul style="list-style-type: none"> • Protecting water resources (coastal lakes and aquifers) from pollution. • Poor water quality is affecting the environmental health of water sources.
<p>Potential combinations</p>	<p>This option could be combined with:</p> <ul style="list-style-type: none"> • Option 8. Reuse of reclaimed water • Option 9. Managed aquifer recharge investigations and policy • Option 44. Planning for land use pressures on coastal groundwater resources.
<p>Considerations</p>	<p>Stormwater is a climate-dependent supply and stormwater storages need to be large enough to capture large rainfall events during the wet season and supply it throughout the dry season. In addition, stormwater is associated with pollutants and requires adequate treatment prior to use. As such, the cost of stormwater harvesting and reuse schemes can be high, making large scale projects more attractive.</p> <p>Water sensitive urban design opportunities are best identified at planning, subdivision and development stage. However opportunities may arise when street drainage, guttering and footpath renewal are undertaken by local government.</p>
<p>Objectives</p>	

Option 31. Bringing back riverine and estuarine habitats and threatened species

Source: Department of Primary Industries—Fisheries

<p>Description</p>	<p>The riparian and aquatic habitat of NSW has suffered a serious decline in quality and quantity since European settlement. Impacts associated with urban, industrial and agricultural development and bushfires have placed significant pressure on the natural environment. The ‘Bringing Back Threatened Species’ program would improve the condition, connectivity and resilience of habitat and landscape through protecting and enhancing priority areas using best practice management. It would also improve water quality, which provides benefits for the cultural, social and economic wellbeing of river-reliant communities.</p> <p>The option can also build skills and share the knowledge of local landholders, community groups and Aboriginal people.</p> <p>The project would use a catchment management framework and be structured as a five-year partnership, with a scoping study in the first phase to identify high priority targeted works, project partners and detailed costs. On-ground works and monitoring and evaluation would proceed in Stage 2 of the project.</p>
<p>Intent</p>	<ul style="list-style-type: none"> • Improve water quality in watercourses. • Maintain and improve native fish access to core habitat in the South Coast region. • Improve recreational and cultural fishing and regional tourism opportunities. • Improve river ecology by reducing extractions from low streamflows. • Improve knowledge sharing and education.
<p>Challenges addressed</p>	<ul style="list-style-type: none"> • Poor water quality is affecting the environmental health of water sources. • Improved recognition of the relationship between healthy riparian zone and river outcomes with availability of water from increased channel storage for waterways managed on a total catchment management basis. • Major rivers in the region are under hydrologic stress. • Protecting native and threatened aquatic species.
<p>Potential combinations</p>	<p>This option could be combined with:</p> <ul style="list-style-type: none"> • Option 23. Establish sustainable extraction limits for South Coast surface water and groundwater sources • Option 24. Shift extractions from low streamflows to high streamflows • Option 28. Fish-friendly water extraction • Option 29. Improved fish passage in South Coast rivers • Option 33. Protecting ecosystems that depend on coastal groundwater resources • Option 40. River Recovery Program for the South Coast: a region-wide program of instream works, riparian vegetation and sediment control.
<p>Considerations</p>	<p>On-ground restoration projects require multi-stakeholder partnerships including with Aboriginal and wider community groups and government agencies. Fostering a strong sense of engagement from communities is critical to meeting regional water strategy objectives and this is especially so when it comes to protecting and enhancing the environment. Engagement with the community will support efficient delivery of river and marine estate health outcomes, build a greater understanding of issues facing native fish populations, create ownership of local and regional projects, and provide the government with a significant return on its investment.</p> <p>This option would have links to the statewide ‘Saving Our Species’ program, which is led by the Department of Planning, Industry and Environment—Environment, Energy and Science. Knowledge gleaned from the ‘Saving our Species’ program could add significant value to this option. Collaborating with Local Land Services would also help improve outcomes through acknowledging the existing stewardship by landholders and building their knowledge.</p>
<p>Objectives</p>	

Option 32. Characterising coastal groundwater resources

Source: Department of Planning, Industry and Environment—Water

<p>Description</p>	<p>Over the next 30 years, there will likely be increasing use of and competition for groundwater resources between landholders, towns, irrigation, quarrying/mining and other industries.</p> <p>Furthermore, climate change, including rising sea levels, will impact the recharge rates and storage volumes of coastal groundwater resources. These resources will be under increasing pressure in the coming decades. There is an opportunity is to ensure that groundwater supports a prosperous and liveable South Coast region.</p> <p>To be well placed to respond effectively to the groundwater management challenges of 2020-2050, there is a need to further invest in the characterisation of:</p> <ul style="list-style-type: none"> • coastal sands • floodplain and upriver alluvials • underlying basement rocks—which may have viable hard-rock aquifers in zones of heavy fracturing. <p>In this option, the groundwater resources for these areas would be characterised in six steps:</p> <ol style="list-style-type: none"> 1. Geological, geophysical, geochemical, ecological and hydrogeological field investigations combined with compilation of all available information via a comprehensive literature review. Such field investigation would be done by Department of Planning, Industry and Environment—Water in collaboration with the NSW Geological Survey. This will provide us with baseline information on the availability and vulnerability of the resources (e.g. levels of fracturing, likely water quality, etc). 2. Expansion of the monitoring network and programs. Currently, the NSW Government has a network of monitoring bores and monitors water levels and quality parameters. This was fit-for-purpose for the prior level of development in the South Coast region. This option would determine whether a new injection of funds to upgrade the network/programs is now required, given increasing population pressure and potential climate change impacts. 3. Metering of spearpoints, bores, wells and all other forms of groundwater take. This is being addressed by the NSW Government’s metering reforms. 4. Development of conceptual groundwater models. By combining the data collected in the first three steps we will have a better idea of how much groundwater is available, how it recharges, where it discharges and how the extraction impacts on the resource. Such analysis and synthesis of the data into useful information and insights would be done by Department of Planning, Industry and Environment—Water in collaboration with universities and other research institutions such as ANSTO and CSIRO. 5. Development of numerical groundwater flow and transport model(s) where needed. Historically, the NSW Government has modelled the six large inland alluvial aquifers where most of the state’s groundwater abstraction occurs (predominately for irrigation). Numerical models are also needed for the coastal groundwater resources. This would involve consideration of the impacts of climate change on the availability of groundwater resources given changes to recharge and the salinisation of coastal sands due to sea level rise. The priority for this work across the state will need be determined through a risk assessment process. 6. Publishing of annual resource updates. These would be web-based and include a plain english version of the applicable regulations, explain who and what is impacting the resource, and identify any emerging risks.
<p>Intent</p>	<p>Ensure the NSW Government and the community have the required data and knowledge to inform groundwater management frameworks and decisions.</p>

Option 32. Characterising coastal groundwater resources (continued)

Challenges addressed	<ul style="list-style-type: none"> • Lack of water security threatens the viability and growth of regional industries. • Lack of water security threatens town water supplies. • Sea level rise threatens town water supplies. • Sustainable access to groundwater resources by all water users. • Lack of data to inform decision-making.
Potential combinations	<p>This option could be combined with:</p> <ul style="list-style-type: none"> • Option 33. Protecting ecosystems that depend on coastal groundwater resources • Option 42. Quantify the resource potential of South Coast hard rock aquifers • Option 43. Planning for climate change impacts on coastal groundwater resources • Option 44. Planning for land use pressures on coastal groundwater resources. <p>This option could also be combined with Option 7. Vulnerability of surface water supplies to sea level rise.</p>
Considerations	<p>Development of groundwater sources is an opportunity in coastal regions, in particular to increase reliability of water supply in drought times. This must only be done with an improved understanding of the resources and their dependent ecosystems.</p> <p>Good groundwater management is underpinned by area-specific knowledge of the groundwater resources. Our knowledge of a groundwater resource can always be improved. Although there will always be a need to invest in characterising these resources, the level of investment required at a given time should be guided by the level of current and predicted risk to the resource and opportunities for its development.</p>
Objectives	

Option 33. Protecting ecosystems that depend on coastal groundwater resources

Source: Department of Planning, Industry and Environment—Water

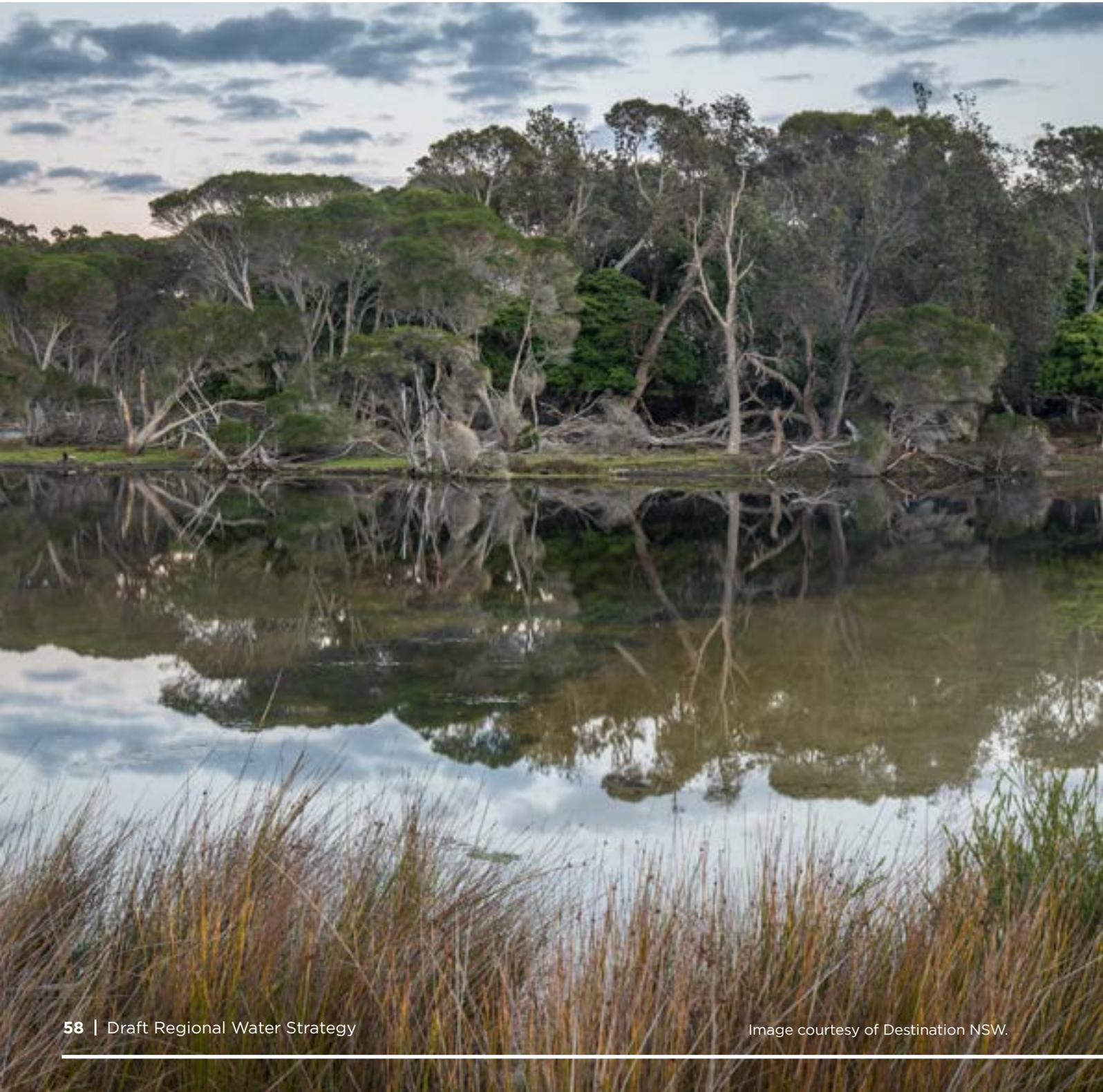
<p>Description</p>	<p>A critical, but often overlooked element of the water cycle is groundwater and groundwater dependent ecosystems (GDEs). GDEs are classified broadly as terrestrial (vegetation communities), aquatic (wetlands and springs) or subterranean (aquifers and caves). They support a variety of fauna and flora communities as well as having inherent environmental value. During droughts when groundwater is needed to support coastal communities, it is critical that groundwater dependent vegetation is also maintained.</p> <p>In this option, a series of projects would be initiated to advance our knowledge and management of GDEs. These projects would:</p> <ul style="list-style-type: none"> • review and develop new methods to monitor the vegetation condition of GDEs (including root depth and response to drought) • develop policy that supports recognition and protection of all GDE types including those that are only partially reliant on groundwater • develop a cost-effective method to monitor the vegetation condition of GDEs • formalise water quality guidelines for groundwater ecosystems • create guidelines on how to characterise a GDE and what an impact assessment should consider • develop a state-level sampling method and assessment guidelines for all GDE types • implement a citizen science project to assess groundwater biodiversity in wells across NSW • explore managed aquifer recharge as a tool/strategy for supporting GDEs, with an emphasis on water quality needs • establish baseline conditions for the groundwater health index on the coast. Currently no data on groundwater quality or ecosystem functions are available for coastal GDEs • identify groundwater bioregions to provide a basis for management and setting baseline conditions for future monitoring and create an information source for offsetting • determine groundwater regimes for GDEs and include climate change in determining threshold changes to GDEs • establish drawdown thresholds that are specific for each GDE type and species requirements • implement a groundwater health index monitoring program and establish baseline conditions for the groundwater health index on the coast • ground truth the GDE schedule in the water sharing plans and 'High Probability High Ecological Value Aquatic Ecosystems GDEs' identified from geographic information system analysis • standardise data/sample collection and reporting by third parties to feed into a centralised database • create a NSW portal for one point of truth for GDEs (including government and industry data) and high-quality metadata (e.g. who collected the data and the method used) • collaborate with universities and other research organisations (for example, via future projects included in the Water Science Research Prospectus) • revise the High Ecological Value Aquatic Ecosystems geographic information system layer used for risk assessments • review and amend water sharing plans to list high-priority GDEs.
<p>Intent</p>	<p>Support groundwater dependent ecological processes that support soils, fauna and flora and establish and maintain environments that are valuable to coastal NSW.</p>

Option 33. Protecting ecosystems that depend on coastal groundwater resources (continued)

<p>Challenges addressed</p>	<ul style="list-style-type: none"> • Poor water quality is affecting the environmental health of water sources. • Lack of data to inform decision-making. • Protecting water resources (coastal lakes and aquifers) from pollution. • Protecting native and threatened aquatic species. • Lack of water security impacts upon environmental assets. • Sea level rise threatens environmental assets.
<p>Potential combinations</p>	<p>This option would build on information and understanding gained from Option 32. Characterising coastal groundwater resources.</p> <p>This option could be combined with:</p> <ul style="list-style-type: none"> • Option 31. Bringing back riverine and estuarine habitats and threatened species • Option 35. Improved data collection and information sharing.
<p>Considerations</p>	<p>Development of groundwater sources is an opportunity in the South Coast region to increase reliability of water supply in drought times. This must only be done while protecting the resources and their dependent ecosystems.</p> <p>This option requires:</p> <ul style="list-style-type: none"> • increased bore network to target GDE locations for monitoring and evaluation • better quantification of the relationship between GDEs and groundwater availability and extraction limits • understanding the role of natural recharge and flooding on GDEs • groundwater salinity monitoring and management • educational and communication material to promote awareness of GDEs including the relationships between above and underground processes and benefit to the local environment • inclusion of Aboriginal cultural connections to GDEs • consideration of changes to water sharing plans to include additional high priority GDEs.
<p>Objectives</p>	

Supporting water use and delivery efficiency and water conservation

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



Option 34. Active and effective water markets

Source: Department of Planning, Industry and Environment—Water

Description	<p>Water markets should allow water access licence holders to trade water in connected systems to where it is most needed. However, barriers often prevent effective trade. This option proposes to review the effectiveness of water markets (unregulated, regulated and groundwater) in the South Coast, including their ability to contribute to improved water security outcomes in the region.</p> <p>The review could examine the regulatory (water rights, use and pricing) and hydrological and operational (delivery and metering) challenges and opportunities associated with developing an effective water market for the region and propose ways to overcome existing barriers. The review could include an investigation into why there is a large proportion of inactive entitlement in the Brogo regulated river system.</p>
Intent	<ul style="list-style-type: none"> • Provide transparency and confidence to water users. • Educate water users about the operation of and rules governing water trade. • Improve and broaden the market to create opportunities to move water more effectively.
Challenges addressed	<p>Lack of water security threatens the viability and growth of regional industries.</p>
Potential combinations	<p>This option could be combined with several options aimed at improving water efficiency and sustainable water use.</p>
Considerations	<p>The water market in the South Coast has been almost completely inactive since the dealing rules were established in water sharing plans. There are no established water brokers in the region, information about the water market is limited and some water users have expressed frustration about administrative barriers to trade.</p> <p>A large proportion of entitlement in the Bega-Brogo regulated river system is inactive, which not only represents a wasted resource, but also restricts annual water determinations for all general security water access licence users.</p> <p>Since the preparation of the existing water sharing plans, we have developed a better understanding about the ecological value of specific reaches of streams. This knowledge provides an opportunity to review and introduce more sophisticated trade zones and rules. There is also an opportunity to learn from the more developed water markets that exist in the southern Murray-Darling Basin.</p>
Objectives	 <p>The icons consist of: 1) Two hands holding a coin with a dollar sign, symbolizing financial goals or investment. 2) A house with a family (man, woman, child) standing in front, symbolizing community or social well-being. 3) A water tap with a dollar sign inside a circle, symbolizing water management or infrastructure investment.</p>

Option 35. Improved data collection and information sharing

Source: Department of Planning, Industry and Environment—Water

<p>Description</p>	<p>The South Coast region suffers from a paucity of water data, particularly regarding streamflows, water quality in surface and groundwater systems, and groundwater levels. There is also a lack of data on fish communities, as well as an understanding of the relationship between flow and native fish and ecological health in the region.</p> <p>This option proposes that the NSW Government improves data collection on the environment (particularly streamflow, water quality and groundwater levels), industrial water use (by industry sector) and town water in the South Coast region. This would improve information and knowledge to inform future water planning and management decisions in the region.</p> <p>This could include:</p> <ul style="list-style-type: none"> • investigating ways to efficiently work with and support water data collection by local water utilities and water providers, including metered water use data collected through the implementation of the non-urban metering framework from 1 December 2023 onwards • investigating ways to work with and support water data collection by industries • coordinating with WaterNSW to undertake an audit of monitoring bore integrity • investigating opportunities to refurbish existing infrastructure (such as groundwater monitoring bores) and installing new infrastructure and technology to enable better collection of water flows, levels and quality parameters • reviewing the water monitoring programs that use the monitoring infrastructure and preparing a unified state-wide monitoring program strategy • gathering more information on factors affecting water quality (e.g. flows required to maintain ecological processes, latitudinal and longitudinal connectivities, drainage of wetlands/backswamps, impacts of bushfires on water quality and impacts of migration of saltwater due to extractions) • consideration of how best to share data (both publicly and within government) and the information products that are needed for different types of water users and water managers • developing an open and comprehensive data-sharing platform to enable government, councils, natural resource management organisations and citizen scientists to both submit and access important water data • developing 3D geological, numerical flow and reactive transport models for groundwater systems to inform future management practices. <p>In relation to fish communities, this option could include:</p> <ul style="list-style-type: none"> • structural assessment of fish communities • development of ecological monitoring, evaluation and reporting frameworks • development of environmental water requirements to understand flow related biological needs for aquatic biota (e.g. native fish, frogs and birds) including threatened species.
<p>Intent</p>	<p>Inform future water management decisions in the South Coast region.</p>
<p>Challenges addressed</p>	<p>Lack of data to inform decision-making.</p>
<p>Potential combinations</p>	<p>This option would support the design, development and implementation of future options for the South Coast region.</p>

Option 35. Improved data collection and information sharing (continued)

<p>Considerations</p>	<p>A lack of necessary fish data is preventing the development of the objectives and indicators required to manage commercial, recreational and threatened fish species. It is also hampering identification of environmental flow requirements and development of aquatic habitat strategies.</p> <p>Given the complexity of data needs and the number of agencies required, a strong governance and coordination framework is needed to coordinate and plan improvements.</p> <p>This option would also need to consider:</p> <ul style="list-style-type: none"> • provision of guidance/guidelines on data provision • performance reporting requirements for local water utilities • setting requirements for standardising data loggers and data formats for monitoring bores • how to improve data quality and increase sampling compliance by implementing a quality management program • how best to apportion clear roles and responsibilities • funding arrangements for ongoing monitoring • links with the NSW non-urban water metering framework • incentives to encourage monitoring, data provision and use of the resulting data sets (e.g. through pricing structures) • integration with existing NSW Government data platforms such as sharing and enabling environmental data (SEED). <p>This option may also require:</p> <ul style="list-style-type: none"> • a hydrometric review of existing gauges • a review of legislation around point versus diffuse pollution sources and defining the roles and responsibilities for both types of pollution across government agencies • a review of the legislative mechanisms for managing groundwater quality • integration with a state-wide strategy for monitoring groundwater quality.
<p>Objectives</p>	
<p>Further information</p>	<p>NSW Non-urban metering framework: www.industry.nsw.gov.au/water/metering</p> <p>SEED (portal for Sharing and Enabling Environmental Data): www.seed.nsw.gov.au/</p>

Option 36. Weir at Brogo-Bermagui town water supply off-take

Source: Bega Valley Shire Council

Description	<p>Approximately 5 ML of water must be released from Brogo Dam for every 1 ML extracted by Bega Valley Shire Council for its Bermagui town water supply. This option proposes constructing a weir at the off-take site to allow water to be delivered more efficiently, increasing water availability to all Bega-Brogo regulated river system water users. Reducing the high volume of water bypassing the current intake structure will significantly extend the supply period to Bermagui during severe drought.</p>
Intent	<ul style="list-style-type: none"> • Improve town water supply access to water. • Improve industry access to water.
Challenges addressed	<ul style="list-style-type: none"> • Lack of water security threatens town water supplies. • Lack of water security threatens the viability and growth of regional industries.
Potential combinations	<p>This option could be combined with:</p> <ul style="list-style-type: none"> • Option 3. Water treatment plant for Brogo-Bermagui town water supply system • Option 29. Improved fish passage in South Coast rivers • Option 37. Shorten the Bega-Brogo regulated river system.
Considerations	<p>A weir at the Brogo-Bermagui off-take is Bega Valley Shire Council's preferred option for managing access to its town water supply from the Bega-Brogo regulated river system. Pipeline options may not be viable due to the local terrain being rocky with steep valleys and gullies.</p> <p>The aim of this option is to create a weir pool with sufficient capacity to maintain an operable water level during pump cycle run-times during low flow times and better enable low-flow release management from Brogo Dam. Downstream water users would be unaffected because supplies for downstream use and environmental flows would continue to be met through WaterNSW's operation of the dam during dry times.</p> <p>This option would require assessment of flow modifications or changed operational regime on connectivity including fish passage, native fish (including threatened species), ecological communities and ecosystems.</p>
Objectives	

Option 37. Shorten the Bega-Brogo regulated river system

Source: Department of Planning, Industry and Environment—Water

<p>Description</p>	<p>When flows in the Bega River are low, and water levels in the estuary are high, substantial releases (around 50 ML/day) are required to hold back the ingress of saltwater into the lower end of the regulated river system. The upstream movement of saltwater is also managed with the installation of a sand barrage at Jellat Jellat. Large required daily releases have contributed significantly to the rapid decline in Brogo Dam levels during extended dry periods, such as in 2017/2018 and 2019/2020.</p> <p>This option would reduce or remove the need for such large dam releases by removing the demands and shortening the length of the regulated river system. This could be achieved by various means, including:</p> <ul style="list-style-type: none"> • a pipeline to transfer water from the Brogo River to tidal pool users • incentives for lower end water users to trade or retire entitlements • a government buy-back of licences from lower-end users.
<p>Intent</p>	<p>Reduce operational losses from Brogo Dam and increase access to water for town water supplies and industry.</p>
<p>Challenges addressed</p>	<ul style="list-style-type: none"> • Lack of water security threatens the viability and growth of regional industries. • Lack of water security threatens town water supplies.
<p>Potential combinations</p>	<p>This option could be combined with:</p> <ul style="list-style-type: none"> • Option 7. Vulnerability of surface water supplies to sea level rise • Option 8. Reuse of reclaimed water • Option 19. Increase capacity of Brogo Dam • Option 32. Characterising coastal groundwater resources • Option 36. Weir at Brogo-Bermagui town water supply off-take • Option 38. Increase general security allocations in the Bega-Brogo regulated river system.
<p>Considerations</p>	<p>The impacts of reduced releases on the Bega Sands and the lower Bega need to be investigated and well understood for this option to be progressed. We need to better understand the role that releases from Brogo dam play in controlling potential saltwater ingress into the lower Bega River and the Bega Sands, and supporting groundwater recharge processes.</p> <p>WaterNSW has reported that customers support investigating a pipeline option to the tidal pool water users from the Brogo River in lieu of formalising the temporary sand barrage.</p> <p>Shortening the regulated river would decrease the number of customers (unless they can be serviced by the new direct pipeline), which could further reduce the already low revenue generated by this system.</p> <p>Reducing the government subsidy at Brogo Dam is a longstanding issue that the NSW Government is trying to resolve.</p> <p>The impacts of reduced releases on river function and health would also need to be considered, including the impact on the frequency of natural openings of the estuary.</p> <p>Increased financial and technical support would enable Bega Valley Shire Council to develop a Coastal Management Program for the Bega River, including a threat and risk assessment of water resource related actions on the health of the Bega River.</p>
<p>Objectives</p>	

Option 38. Increase general security allocations in the Bega-Brogo regulated river system

Source: Bega Valley Water Users Association

<p>Description</p>	<p>A high proportion of entitlement in the Bega-Brogo regulated river system is not used. As a consequence, annual water determinations are relatively low, which (anecdotally) discourages further investment in water-based industries in the Brogo River Valley.</p> <p>However, active users are seeking an increase to general security water allocations which are currently constrained by Brogo Dam being oversubscribed. This is further hindered by the high number of inactive sleeper licences being held in the Bega-Brogo regulated river system.</p> <p>This option would consider various means by which the reliability of allocations could be increased, including:</p> <ul style="list-style-type: none"> • increasing the capacity of Brogo Dam • activating sleeper entitlement • licence holders being encouraged to retire licences • government buying back licences.
<p>Intent</p>	<p>Increase water security for industry.</p>
<p>Challenges addressed</p>	<p>Lack of water security threatens the viability and growth of regional industries.</p>
<p>Potential combinations</p>	<p>This option could be combined with:</p> <ul style="list-style-type: none"> • Option 19. Increase capacity of Brogo Dam • Option 34. Active and effective water markets • Option 37. Shorten the Bega-Brogo regulated river system.
<p>Considerations</p>	<p>This option would need to assess the impact of increased allocations on the water security of existing regulated licence holders.</p> <p>This option would improve start of water year allocations for general security water access licence holders. This would provide irrigators improved clarity and encourage investment in their farming practices to meet their peak irrigation water demands, which are generally early in the water year. This could directly impact on production and promote growth and diversification in the region's agricultural sector.</p>
<p>Objectives</p>	

Option 39. Regional network efficiency audit

Source: Department of Planning, Industry and Environment—Water

<p>Description</p>	<p>Leakage is the component of water that is lost from water delivery systems. Leakage, or non-revenue water, can be categorised as:</p> <ul style="list-style-type: none"> • reported bursts—visible at the surface and reported by the public or utility staff • unreported bursts—not visible at the surface, and usually picked up through investigation or leak detection surveys • background leakage—small leaks that cannot be detected by, which over time may gradually worsen until they can be detected. <p>The proportion of non-revenue water is higher across the South Coast than the NSW median, particularly in the more remote and sparsely populated Eurobodalla Shire and Bega Valley Shire local government areas. This option would establish a region-wide audit of major water supply network infrastructure leakage to assess the volumes and locations of leakage against agreed performance indicators. The audit would also identify opportunities and region-wide strategies to reduce leakage, for example through improved leak detection and hydraulic control.</p>
<p>Intent</p>	<p>Increase resilience of the regional water supply.</p>
<p>Challenges addressed</p>	<p>Water conservation for improved water efficiency.</p>
<p>Potential combinations</p>	<p>This option could be combined with Shoalhaven Water, Eurobodalla Shire and Bega Valley Shire water efficiency programs.</p>
<p>Considerations</p>	<p>Water lost to leakage on the South Coast ranges between 50 L and 70 L per connection per day. Whilst this is below the state average for water utilities, it is a substantial volume equating to more than 10% of all potable water produced. Research suggests water supply customers expect utilities to do their best to minimise leaks and breaks and reduce water waste, especially when they are asked to save water during drought conditions. However, leakage reduction measures are sometimes less cost-effective than other options to improve water supply efficiency.</p> <p>According to the Water Services Association of Australia, water utilities across Australia use different strategies to reduce leakage including:</p> <ul style="list-style-type: none"> • pressure management—reduction of excess average and maximum pressures • active leakage control—monitoring of flows in metered areas to identify leaks and repair before they become a greater issue • pipeline and assets management—material selection, installation, maintenance, rehabilitation and replacement, and is commonly associated with renewals • speed and quality of repairs—repairs done quickly and to a suitable standard. <p>This option would assess the effectiveness of leakage strategies adopted by South Coast region local water utilities and identify opportunities for these strategies to combine to positively influence each other.</p>
<p>Objectives</p>	 
<p>Further information</p>	<p>Water Services Association of Australia Ltd 2019, Reducing Leakage in Australia: www.wsaa.asn.au/publication/reducing-leakage-australia</p>

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 40. River Recovery Program for the South Coast: a region-wide program of instream works, riparian vegetation and sediment control

Source: Community, Department of Planning, Industry and Environment

<p>Description</p>	<p>Land clearing associated with European settlement has had detrimental impacts on river catchments in the South Coast region. Due to the removal of vegetation and straightening of rivers, water now moves more quickly through the catchment, leading to less water being stored in the landscape and consequently longer dry periods. Furthermore, water now moves through the landscape with more energy, eroding land and degrading water quality by increasing sediment loads. Recent bushfires in the region have considerably exacerbated these challenges.</p> <p>Instream works such as log jams, rock chutes and log weirs, along with riparian vegetation, can help reverse this degradation by slowing the movement of water through the landscape, creating instream water storages, reducing erosion and decreasing sediment loads instreams.</p> <p>This option will consider the costs and benefits of a region-wide program to better manage catchment hydrology and erosion by providing landholders with financial assistance and technical expertise. Such a program would build on previous work, as well as current programs such as the Coastal Management Programs that are being developed by local councils.</p>
<p>Intent</p>	<ul style="list-style-type: none"> • Slow the movement of water through the catchment. • Reduce stream-bed and bank erosion. • Improve water quality in watercourses. • Attenuate minor flood flows. • Increase in-channel water storage and groundwater recharge. • Increase water security for industry. • increase drought resilience of industry.
<p>Challenges addressed</p>	<p>Climate change will exacerbate the impacts of poor catchment management; increasing the frequency of poor water quality events.</p>
<p>Potential combinations</p>	<p>This option could be combined with:</p> <ul style="list-style-type: none"> • Option 11. Instream dam at Reedy Creek • Option 16. Increased on-farm water storage • Option 17. A grid of off-stream storages in the Bega Valley • Option 18. Tuross River barrage • Option 20. Increase capacity of Cochrane Dam • Option 21. Brown Mountain Water Project (pumped hydro scheme) • Option 22. Instream dam at Crystalbrook • Option 24. Shift extractions from low streamflows to high streamflows • Option 28. Fish-friendly water extraction • Option 29. Improved fish passage in South Coast rivers • Option 31. Bringing back riverine and estuarine habitats and threatened species.

Option 40. River Recovery Program for the South Coast: a region-wide program of instream works, riparian vegetation and sediment control (continued)

<p>Considerations</p>	<p>A River Recovery Program that is properly resourced with regard to policy, technical and financial resources could be designed and delivered through a regional delivery model involving collaboration between the Department of Planning, Industry and Environment—Water, Department of Planning, Industry and Environment—Environment, Energy and Science, Department of Primary Industries—Fisheries and the South East Local Land Services.</p> <p>Although there are considerable benefits to be gained, there is also scope for instream works to have detrimental effects on the environment, flood hazards and water users if not properly implemented or if implemented in the wrong places. A program such as this needs significant scientific/technical support to ensure the options being considered are suitable for their proposed locations.</p> <p>Instream works are also expensive, often require the most productive land to be taken out of production and their benefits may take years to be fully realised. Instream works must also be designed and constructed by experts in the fields of river engineering and fluvial geomorphology. There are numerous examples across the state where poorly designed and poorly constructed works have exacerbated rather than reduced soil erosion.</p> <p>The NSW Government has previously provided financial incentives and technical expertise to construct instream works at several key sites across the South Coast. However, many more sites need to be rehabilitated to ensure the future health of the region’s catchments.</p> <p>Furthermore, this option must build on the knowledge gained from previous river restoration efforts. History has shown that even well-established instream works and riparian vegetation are susceptible to major flood events.</p> <p>This option supports a number of actions proposed by the <i>NSW Marine Estate Management Strategy 2018-2028</i>, including:</p> <ul style="list-style-type: none"> • Action 1.3.2: Riparian vegetation improvements by planting native trees, shrubs and ground covers and fencing out stock from waterways. • Action 1.3.4: Bank protection works to reduce sediment input into estuaries from eroding river banks. • Action 1.2.11: Conducting social research into behaviour around what drives different agricultural industry groups and communities to adopt change and how to influence the adoption of agricultural best management practice for priority industries. • Action 1.3.6: Road and track improvements, such as road surface sealing or stormwater runoff controls, to reduce sediment input into waterways from unsealed roads.
<p>Objectives</p>	
<p>Further information</p>	<p>NSW Marine Estate Management Strategy 2018-2028: www.marine.nsw.gov.au/marine-estate-programs/marine-estate-management-strategy</p> <p>Further support for the design of a River Recovery Program, including technical and policy knowledge (from the former RiverCare Program—1990s and River Planning is available from the Department of Planning, Industry and Environment—Environment, Energy and Science Water Floodplains and Coast team in Wollongong.</p>

Option 41: Apply the NSW Extreme Events Policy to the South Coast region

Source: Department of Planning, Industry and Environment—Water

<p>Description</p>	<p>The NSW Extreme Events Policy provides a transparent framework for making decisions during extreme events, including what those decisions are, when they are made and who makes them. This information allows water users to make plans during extreme events with more confidence and provides more certainty for the water market.</p> <p>The policy is designed to facilitate early intervention and delay the need to suspend certain water sharing arrangements so that suspension only occurs during more severe water stress and water quality events.</p> <p>The policy establishes the principles for managing extreme events for major water sources. It provides a transparent decision-making framework based on an assessment of risk and need in the face of competing priorities and demands.</p> <p>This option would:</p> <ul style="list-style-type: none"> • amend the Extreme Events Policy to apply to all of NSW • establish a Critical Water Advisory Panel for the South Coast region • developing an incident response guide for the South Coast region.
<p>Intent</p>	<p>Provide clarity in decision-making during periods of drought.</p>
<p>Challenges addressed</p>	<p>Region is likely to experience future droughts more severe than those on record.</p>
<p>Potential combinations</p>	<p>This option could be combined with any option aimed at improving water security and strengthening community preparedness for drought.</p>
<p>Considerations</p>	<p>Development of environmental water requirements could inform extreme event thresholds.</p> <p>Currently, the policy only applies to the Murray-Darling Basin. This option would extend the policy to coastal regions as well to provide local water utilities and other water users clarity and direction during periods of drought.</p> <p>The extreme events covered could also include the impact of rainfall and flooding associated with former tropical cyclones, and water infrastructure recovery.</p> <p>A review of the policy following the most recent drought has highlighted possible improvements to the framework that should be considered before applying the existing policy to coastal areas.</p>
<p>Objectives</p>	
<p>Further information</p>	<p>Extreme Events Policy: www.industry.nsw.gov.au/water/what-we-do/legislation-policies/eep</p>

Option 42: Quantify the resource potential of South Coast hard rock aquifers

Source: Department of Planning, Industry and Environment—Water

Description	<p>Entitlements for hardrock aquifers represent about 6% of the total water access licensed volume across the South Coast. Entitlements for coastal sand aquifers represent less than 1%. The Geological Survey of NSW undertakes mineral, energy and water exploration and this option would develop a project for the joint exploration of fractured (hard) rock aquifers to detect groundwater in key locations throughout the South Coast region.</p> <p>This option would include regional and locally targeted geophysics to identify potential resources followed by drilling, testing and water quality analysis to assess the resource’s suitability as a water supply.</p>
Intent	<p>Identify alternative water sources and storage for a more diverse and secure water supply.</p>
Challenges addressed	<ul style="list-style-type: none"> • Lack of water security threatens the viability and growth of regional industries. • Lack of water security threatens town water supplies. • Lack of water security impacts communities.
Potential combinations	<p>This option would feed into and could be combined with:</p> <ul style="list-style-type: none"> • Option 23. Establish sustainable extraction limits for South Coast surface water and groundwater sources • Option 32. Characterising coastal groundwater resources.
Considerations	<p>Key locations for exploration would be chosen according to existing demands (e.g. close to large populations) and land types suitable for commercial agriculture.</p> <p>Local water utilities have had limited success with establishing borefields in coastal sand aquifers on the South Coast (e.g. south of Broulee), finding them unreliable for substantial volumes of extraction.</p> <p>The resource potential of hard rock (fractured rock and porous rock) aquifers in the South Coast region has not been clearly defined. Eurobodalla Shire Council recently commissioned a groundwater investigation in the lower Tuross Valley. This study did not identify any substantial hard rock groundwater resource, which is consistent with drilling investigations commissioned by local landholders. Similarly, Sundararamaya (1983) reported that yields from fractured bedrock are likely to be very low (approximately 1 L/s) and therefore not worth investigating for town water supply.</p>
Objectives	

Option 43. Planning for climate change impacts on coastal groundwater resources

Source: Department of Planning, Industry and Environment—Water

<p>Description</p>	<p>Coastal groundwater resources provide fresh and easy-to-access water for communities and industries. They support baseflows to creeks and rivers and provide water for ecosystems.</p> <p>The shallow nature of coastal groundwater resources provides advantages but also means they are vulnerable to the impacts from climate change and sea level rise. Possible impacts include:</p> <ul style="list-style-type: none"> • reduced water availability for consumptive use and the environment due to reduced groundwater recharge from changes in rainfall and increased evapotranspiration • salination of aquifers by seawater intrusion, inundation and user drawdown, impacting both water supplies and ecosystems that rely on groundwater • waterlogging, contamination (from septic tanks or inadequately designed or maintained bores) and flooding due to high groundwater tables. <p>The expected magnitude of these impacts varies greatly depending on local conditions.</p> <p>In this option, Department of Planning, Industry and Environment would collaborate with Local Land Services, councils and universities to co-design and implement local-scale projects to:</p> <ul style="list-style-type: none"> • identify areas at risk to one or more of the above impacts • undertake numerical modelling to predict the impacts • conduct a quantitative risk assessment of salinity induced by land management and pumping in all groundwater sources • create monitoring networks and programs to measure the impacts • establish a cross-agency governance group to annually review the above three steps and publish its findings online for transparency and accountability. <p>The projects would lead to better:</p> <ul style="list-style-type: none"> • recharge estimates under various climate change scenarios • informed long-term annual extraction limits (reviewed every 5-10 years) for coastal groundwater sources • science to review assessment criteria for coastal groundwater applications.
<p>Intent</p>	<ul style="list-style-type: none"> • Prepare for the impacts of climate change and sea level rise on groundwater sources in coastal regions. • Sustainable access to groundwater resources by all water users.
<p>Challenges addressed</p>	<ul style="list-style-type: none"> • Lack of data to inform decision-making. • Lack of water security impacts communities.
<p>Potential combinations</p>	<p>This option would build on Option 32. Characterising coastal groundwater resources.</p> <p>This option could also be combined with Option 1. Pipeline from Brogo Dam to Bega-Tathra town water supply system.</p>
<p>Considerations</p>	<p>Development of groundwater sources is an opportunity in coastal regions to increase reliability of water supply in drought times. This must only be done with an improved understanding of the resources and the impacts of climate change.</p> <p>The expected magnitude of the impacts varies greatly depending on local conditions.</p>
<p>Objectives</p>	



Option 44. Planning for land use pressures on coastal groundwater resources

Source: Department of Planning, Industry and Environment—Water

<p>Description</p>	<p>Coastal aquifers provide reliable water sources during droughts and produce good quality, high yielding groundwater. However, these aquifers require careful management because they are vulnerable to contamination and are coming under increasing pressure from growing coastal populations. Land use planning needs to consider the impact of changes to land use on aquifer recharge and storage areas, particularly where coastal aquifers are identified as being key to the future water security of population growth and development in these areas.</p> <p>Key challenges affecting coastal groundwater sources are:</p> <ul style="list-style-type: none"> • changes to recharge—urban populations increase impermeable surfaces • changes to storage—sand mining reduces the aquifer storage capacity and sustainable yield • changes to stream base flows and impacts to natural stream ecology and geomorphology • acid pollution—dewatering aquifers (e.g. sand mining) can expose acid sulfate soils and mobilise toxic metals • saltwater intrusion—excessive pumping coastal bores allows saline water to flow into the fresh aquifer, with climate change potentially exacerbating these impacts • groundwater pollution—waste products from agriculture, on-site wastewater systems, industry and urban environments. <p>How activities are managed on the land surface directly impacts the underlying aquifers. Land and groundwater management need to be carefully integrated.</p> <p>This option would undertake a review to:</p> <ul style="list-style-type: none"> • identify the key challenges facing coastal groundwater resources in NSW • assess whether the current legislation is fit-for-purpose in addressing the key challenges • identify gaps in current policy and regulation, and make recommendations for regulatory reform • develop partnerships with Local Land Services to coordinate activities and work towards changing land practices • engage with councils in relation to the level of protection of key aquifer systems within local environmental plans • clarify roles and responsibilities for each government department in managing coastal groundwater sources • set-out a strategic framework for the integration of land and groundwater management on the coast.
<p>Intent</p>	<p>Provide for development while protecting groundwater resources.</p>
<p>Challenges addressed</p>	<ul style="list-style-type: none"> • Mitigate impacts of urban and rural land management activities on water quality. • Sustainable access to groundwater resources by all water users.
<p>Potential combinations</p>	<p>This option would build on the information obtained from Option 32. Characterising coastal groundwater resources.</p> <p>This option could also be combined with:</p> <ul style="list-style-type: none"> • Option 9. Managed aquifer recharge investigations and policy • Option 30. Improve stormwater management.

Option 44. Planning for land use pressures on coastal groundwater resources (continued)

<p>Considerations</p>	<p>Development of groundwater sources is an opportunity in coastal regions, in particular to increase reliability of water supply in drought times. This must only be done with an improved understanding of the resources and the impacts of land uses.</p> <p>Consideration needs to be given to the roles and responsibilities of different agencies, as groundwater protection functions are spread across levels of government and different government agencies.</p> <p>Currently there are three main pieces of legislation relevant to the management of coastal aquifers:</p> <ul style="list-style-type: none"> • <i>Water Management Act 2000</i> provides guidance for the licensing or approval of activities that intersect the groundwater as well as the development of water sharing plans for water sharing water use, drainage, and floodplains • <i>Environmental Planning and Assessment Act 1979</i> provides a framework for consideration of the impacts of a development on coastal sands systems. Local governments on the South Coast are required to prepare local environmental plans under this act, and some have also included special provisions relating to protection of aquifer systems in their local environmental plans • <i>Protection of the Environment Operations Act 1997</i> can also be used to manage groundwater contamination. <p><i>The Coastal Management Act 2016</i> must also be considered which establishes management objectives to protect, enhance, maintain and restore the environment of the coastal zone.</p> <p>The <i>Strategic Regional Land Use Policy 2012</i> (and subindustry region-based plans) and <i>Aquifer Interference Policy 2012</i> are also relevant.</p> <p>The <i>Contaminated Land Management Act 1997</i> includes powers for the NSW Environment Protection Authority to regulate and rehabilitate contamination sources and to manage and prevent water pollution.</p>
<p>Objectives</p>	

Options not progressed

Five options that were proposed during our consultations on the Draft South Coast Regional Water Strategy are not included in the long list of options. The table below lists these options and describes why they have not been progressed.

Option	Description	Reason for not progressing
New town water supply pipeline to Bermagui	This option involves augmenting Bega Valley Shire’s existing pipeline to Bermagui from the Bega-Brogo regulated river system (Source: WaterNSW)	Population growth projections do not warrant a larger diameter pipeline over the 30-year planning period.
Construction of pipeline from Brogo to Narooma	Connect Eurobodalla Shire Council’s southern water supply system to the Bega-Brogo regulated river system (Source: WaterNSW)	Eurobodalla Shire Council is proceeding with the Southern Storage and using medium to high flows from the Tuross River. The option of Brogo Dam being connected into a link between the Eurobodalla Shire Council and Bega Valley Shire Council town water supply systems is being considered (Option 6), but a stand-alone option of a pipeline from Brogo Dam to Narooma is not considered feasible.
Brogo Dam removal	Decommission Brogo Dam to address low flow utilisation issues (Source: WaterNSW)	This option has little community support and no support from local councils.
Addressing cold water pollution	Evaluate the degree of cold water pollution impacts from existing storages in the South Coast and to work with asset owners to implement appropriate capital and operational responses to mitigate those impacts (Source: Department of Primary Industries—Fisheries)	The potential for cold water pollution is low across the South Coast. Cochrane Dam is the only dam in the region estimated to cause moderate cold water pollution effects. It is one of 18 dams identified by the NSW Government for investigation and possible action over the next 15 years. Cold water pollution impacts would be an important consideration in a number of options (see for example Options 11, 19, 20 and 22).
Public access to water storages for recreation	Develop local water storages to support recreation activities (Source: Eurobodalla Shire Council)	This is recognised as an important contributor to the region’s liveability and economy, but is considered a local scale option and not suitable for consideration as part of a broader regional water strategy.



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