Central and Gippsland Region Sustainable Water Strategy

Discussion Draft

VICTORIA State Government

Environment, Land, Water and Planning

Author

The State of Victoria Department of Environment, Land, Water and Planning 2021

Acknowledgment

We acknowledge and respect Victorian Traditional Owners as the original custodians of Victoria's land and waters, their unique ability to care for Country and deep spiritual connection to it. We honour Elders past and present whose knowledge and wisdom has ensured the continuation of culture and traditional practices.

We are committed to genuinely partner, and meaningfully engage, with Victoria's Traditional Owners and Aboriginal communities to support the protection of Country, the maintenance of spiritual and cultural practices and their broader aspirations in the 21st century and beyond.

ISBN 978-1-76105-660-4.

Image: Anglesea River, Wadawurrung Country

Join the conversation

The Victorian Government is inviting the community to help shape the future by joining the conversation. We want to hear your views about how we meet the major water challenges facing the region, and on how we balance different water needs — and the costs of doing so. We want to understand your expectations and priorities before this Strategy is finalised and our plans progress further.

We want to make it easy for you to join the conversation, by offering different ways to be involved. You can give feedback online by completing a survey, writing a submission or attending a community information session.

Feedback closes on 10th of December 2021.

How to join the conversation

- **Community information sessions**

  To register for a community information session across the region visit **www.consultationspace.com/DELWP/Water**

- **Feedback online**

  To complete an online survey, visit **www.consultationspace.com/DELWP/Water**

- **If you can't access the internet, phone us with your feedback**

  Phone: 136 186, Mon–Fri 8am to 6pm, excluding public holidays

- **Make a submission**

  To make a separate submission please go to: **https://engage.vic.gov.au/central-and-gippsland-region-sustainable-water-strategy**

We started discussing our vision and plans with the community in April 2021. We thank everyone who has joined the conversation so far, including the community groups who attended community roundtable discussions, and those who visited the Engage.vic site and submitted a survey response.

This draft discussion Strategy also builds on recent community involvement in related water projects — the Long-Term Water Resource Assessment, Waterways of the West, Barwon River Action plan and the Yarra Strategic Plan — and the consultations and discussions undertaken by water corporations and catchment management authorities across the region.

You can read more about this earlier work at **www.engage.vic.gov.au/central-and-gippsland-region-sustainable-water-strategy.**

Next steps

We will listen to your feedback, priorities and concerns before finalising the Strategy and an implementation plan, which will be released in 2022. The implementation plan will show how the Strategy will be put into action, and will include further opportunities for you to have your say. A consultation report will show what we heard from the community and how your feedback was considered and incorporated.

You can read more about how the Strategy is being developed in **Chapter 13**.

Contents

Measurement

Volumes of water referred to in this document are measured as follows:

One litre	1 litre	1 litre	1 L
One thousand litres	1,000 litres	1 kilolitre	1 kL
One million litres	1,000,000 litres	1 megalitre	1 ML
One billion litres	1,000,000,000 litres	1 gigalitre	1 GL

Image: River water gauge, Latrobe River, Sale, Gunaikurnai Country

Minister's foreword

Victorians know the value of water. We all use it in our homes, farmers use it to grow our food, it has environmental, recreational, and cultural importance and it is necessary for many jobs that underpin the economic prosperity of our state.

Which is why this discussion draft of the Central and Gippsland Region Sustainable Water Strategy – which marks the start of the conversation with the community about the long-term water challenges and opportunities across the region over the next 50 years – is such an important piece of work. Especially in the context of future climate change and population growth.

Over the past 18 months the global COVID-19 pandemic has shown us the value of being prepared for future uncertain events, especially in a changing climate and the high community value placed on our waterways, including the role they play in supporting our mental health and wellbeing.

Victorians know we cannot take water for granted. While in 2021 there is plenty of water flowing into our rivers and storages, it was not long ago that we were experiencing drought. We will continue to have wet years and dry years, but the science is clear – our climate is getting warmer and drier and there is less water flowing into our rivers and dams. We recognise that we have to boost environmental flows where we can but we cannot do this at the expense of farmers and other water users.

We have already done so much to adjust to drying conditions – but there is still more we can do.

We have invested in alternative water sources such as recycled, rainwater and stormwater harvesting, as well as the Victorian Desalination Project and we are looking at ways to build on this for long-term non-rain dependent water security.

Victorians and Melburnians have done a good job saving water but we can do more to ensure we're using water wisely. Melbourne households currently use 70 gigalitres (28,000 Olympic swimming pools) more than the average volume of water that flows naturally into our dams. The Victorian Desalination Project supplies the difference. Without its regular contribution, our storage levels would be 20 per cent lower today, and we would be considering the need for water restrictions.

This Strategy is about planning for the longer-term, to secure the water future of the region. The discussion draft proposes options to save more water, increase use of recycled water, rainwater and stormwater and grow our water supplies. This Strategy seeks to make us more resilient to the impacts of climate change so we have the best water supply options ready ahead of the next drought, and we can protect the health of our rivers for future generations.

There is increasing need for water for a range of purposes including access for Traditional Owners, agriculture and the environmental health of rivers and waterways however no water will be taken from existing entitlement holders.

The Strategy follows the policies set by the Victorian Government in Water for Victoria released in 2016 and builds on the conversations we've had with the community as we develop local plans and strategies.

The Victorian Government is committed to working with Traditional Owners to increase access to water entitlements and increase cultural benefits from the way we store, deliver, and use water.

This is the first time the Government has partnered with Traditional Owners in the development of a Sustainable Water Strategy, an important step forward. I would like to thank the Bunurong Land Council Aboriginal Corporation, Gunaikurnai Land and Waters Aboriginal Corporation, Wadawurrung Traditional Owners Aboriginal Corporation and Wurundjeri Woi-wurrung Cultural Heritage Aboriginal Corporation for their valuable contribution.

I want to hear your feedback on how we manage the region's major water challenges and on how we secure our water needs. We want to understand your expectations and priorities before this Strategy is finalised in 2022, and our plans progress further.

Image: A birdwatcher at Sale Common, Gunaikurnai Country

Chair’s foreword

Water is essential to every part of the Central and Gippsland Region — for daily household use, for growing fresh and local produce on farms, for powering businesses and for industry. Our environment needs water to support healthy rivers and cool, green open spaces, and we need to return water to Traditional Owners to achieve water justice.

The Victorian Government, water sector, representatives from Traditional Owner groups and Victorian communities have been working together to plan for how we can meet the region’s future water challenges of population growth and climate change.

Over the next 50 years the region’s water supplies will need to double just to meet the water needs of cities and towns. Farmers across the region, who have faced tough years with droughts and bushfires, will need to adapt to a drying climate. Furthermore, the environment will need more water to keep rivers alive if they are to be enjoyed by future generations.

Victorians know how to save water, but water efficiency isn’t enough. Building new dams isn’t the solution either because, in the future, not enough water will flow into them to make them worthwhile.

Instead, we need to carefully grow our water sources to become ones that don’t rely on rain, such as desalinated water and recycled water. When it does rain, we need to capture and reuse more stormwater. We need to be smarter about how we share our limited water resources and find new ways to use water to benefit everyone. We will all need to be part of the solution to our future water challenges.

This discussion draft Strategy sets out proposed directions to manage these challenges, but it is just the start of the conversation. Over the coming months there will be many opportunities to meet with representatives from Victorian Government agencies and the water industry in person and online to share your views. Your feedback will help to shape the final Strategy, guiding where we should invest to grow our water supplies, do more with less water and build our climate resilience.

I would like to thank the water industry’s consultative committee, the Traditional Owners and the Victorians who helped inform the development of this consultation draft of the Strategy. In particular, I want to acknowledge the Traditional Owner Partnership for their time and expertise, especially to develop **Chapter 4**, Healthy Country, Healthy Mob. Traditional Owners have a deep cultural and spiritual connection to water. This discussion draft Strategy provides an important opportunity for the water sector and Traditional Owners to work closely together achieving better outcomes for Aboriginal communities as well as the broader region.

I look forward to continuing this conversation with Victorians as we work together to create a long-term plan that meets the water needs of the Central and Gippsland Region.

Christine Forster AM
Chair, Central and Gippsland Region
Sustainable Water Strategy
Consultative Committee

Executive summary

Shaping our water future

Water is an essential service, and access to clean, fit-for-purpose water is a human right. Its availability underpins human health, confidence in present and future economic activity and the viability of our communities, and environmental health and biodiversity. For Traditional Owners, water is a sacred, living entity.

The Victorian Government is working closely with the water sector, Traditional Owner groups and the community to create a long-term plan that meets and balances the water needs of the Central and Gippsland Region. This draft discussion Strategy reflects early community feedback and community involvement in recent water projects in the region. But it is just the start of the conversation. We are inviting you and communities across the region to help shape the future by reading this discussion draft Strategy and providing your feedback.

This discussion draft builds on the policy directions from Water for Victoria, the state's water plan, from 2016. The final Central and Gippsland Region Sustainable Water Strategy will lay the foundations for our transition to a more climate-resilient water future. It will help equip the region to meet two major challenges: population growth and declining water availability. Over the next 50 years, water supplies will need to double just to meet demand in cities and towns across the region. We need to plan now to avoid chronic water shortages that would effect Victoria's liveability and prosperity, with major social and economic impacts. Historic water injustices for Traditional Owners, who have long been excluded from water management decisions and water ownership in Victoria, must be remedied. Additional water for the environment is essential if we are to prevent further decline in the health of many waterways, and water quality must be protected to support a wide range of uses. We also need to look at ways to build the resilience of agriculture to a drying and more variable climate in future.

To do this, the region needs to make greater use of manufactured water sources, such as desalinated water and fit-for-purpose recycled water, as well as stormwater. Rather than being required once in a generation, future investments in new water supplies will be needed more frequently than in the past to meet our growing needs.

This discussion document sets out the Victorian Government's proposed Strategy to:

- manufacture more of our water supplies to reduce reliance and pressure on our rivers
- use water more efficiently
- make better use of all sources of water including recycled water and stormwater
- halt the decline in the region's waterways by returning river flows and preventing the damaging effects of stormwater
- invest incrementally in water supply augmentations as our cities and towns grow
- improve the way we share and distribute water resources while protecting the rights of existing entitlement holders
- keep water prices affordable and as stable as possible
- find local solutions to local problems.

Our plan for the future

This discussion draft Strategy sets out the Victorian Government's plan for a climate-resilient future — a future where the water needs of cities, towns and regional communities are met and where healthy rivers have enough water to support cultural, social and recreational values.

While the region will continue to experience floods, droughts and other extreme events, the long-term drying trend experienced in recent decades is expected to continue. The region's drying climate means that less water is flowing into rivers, and less water is captured in water storages and dams. But there are alternatives. In the future, climate-resilient water supplies from manufactured sources will meet a growing proportion of total water use. This means that, even in a drying climate with more extreme weather events, there will be enough water for cities and towns, farms, industry, rivers, recreation and tourism, and water entitlements can be returned to Traditional Owners. Without a planned approach to sustainable water management, Melbourne and Geelong are at risk of water shortfalls this decade. The region's already flow-stressed rivers will continue to decline, Traditional Owners will continue to be left out, and agriculture and industry will face declining water supplies. Towns such as Warragul and Drouin already rely on temporary access to water from the Tarago system to avoid water restrictions, because local demand exceeds local supplies.

Did you know?

We already rely on the Victorian Desalination Project to secure water supply for Melbourne and surrounding cities and towns:

- Melbourne's annual water usage is currently 70 gigalitres (28,000 Olympic swimming pools) more than the average volume of water that flows naturally into our dams and water storages.
- Geelong's growth means that it relies on its connection to Melbourne's water supplies through the water grid to supplement its local supplies.
- Gippsland towns such as Warragul, Drouin, Korumburra and Cowes rely on water from the Tarago system and the desalination plant for security of supply.
- Growth areas to Melbourne's west and north are in some of the region's driest catchments and will place increasing demand on a shared resource.

The region's warming, drying and variable climate presents challenges for the more than 6 million Victorians who rely on the region for water. Everyone needs to play a part if we are to maintain a reliable, high-quality and affordable water supply for the region's many water demands and values. In particular:

- households need water for daily life
- farmers need water to grow food and fibre
- businesses need water for the region's prosperity
- rivers need water to support native fish, platypus and other species, and for tourism and recreational activities such as fishing, boating and kayaking
- Traditional Owners have a right to water justice, including water entitlements and a real say in how water is managed
- neighbourhoods and outdoor destinations need water for healthy, liveable local neighbourhoods with cool green spaces for communities to enjoy.

This discussion draft Strategy, which has been developed with the water sector and Traditional Owner groups, sets out our vision for how we will meet and balance the region's water needs in the near term (next 10 years) and longer term (next 50 years). Proposed actions will help the region to:

- **support Healthy Country, Healthy Mob** through partnership with Traditional Owners (see **Chapter 4**)
- **use water more efficiently** through changes in behaviour, water-saving tools and incentives, and regulation (see **Chapter 5**)
- **use more manufactured sources** (including desalination and fit-for-purpose recycled water) and stormwater and invest incrementally in small- and medium-scale augmentations that bring many benefits (see **Chapter 6**)
- **make better use of all sources of water** by increasing the use of recycled water, stormwater, rainwater captured in tanks, and desalinated water, to reduce reliance on river water and groundwater (see **Chapter 7**)
- **improve the way we share and distribute water resources** to bring many benefits, including better river health and returning water to Traditional Owners, while protecting the rights of existing entitlement holders (see **Chapter 8**)
- **keep water bills affordable** by investing efficiently in new water infrastructure (see **Chapter 9**)
- **find local solutions to local challenges** (see **Chapters 10, 11** and **12**).

Water efficiency will continue to be important, with greater support and education to help people save water at home and work, in schools, on farms and in industry. Greater use of water-efficient appliances such as showerheads and washing machines will help people save both water and energy, by reducing their hot water use, and will help Victoria meet its target of net zero greenhouse gas emissions by 2050. Farmers will be supported to upgrade inefficient irrigation infrastructure, while businesses and schools will use digital meters to quickly find and fix water leaks.

Nevertheless, although water efficiency measures will help us save large volumes of water, they will not meet all our future water needs.

Water supplies will need to double over the next 50 years to meet population growth and build the resilience of regional communities. Building more dams isn't the solution, because there are no remaining viable dam sites to service this region and in the future there won't be enough rain to fill them. Instead, the region will use more manufactured water supplies that don't rely on rainfall, including desalinated water (for drinking and everyday use) and recycled water, as well as stormwater (for non-drinking uses such as watering crops or sporting fields and for industry) when it does rain in urban areas.

Manufactured water supplies will provide more reliable sources of water that are independent of rainfall, building certainty into our future water management arrangements. Reliable water supply provides confidence for households plus the businesses and industry that are vital to sustain the economic activity and the viability of our communities.

Investments in new water supplies are expected to be required more frequently than in the past, when a large augmentation was made only once in a generation. Current estimates show that up to an additional 10 gigalitres of water per year may be needed to meet the needs of Greater Melbourne and the cities and towns connected to the water grid, including the Barwon and Gippsland regions. Incremental investment in water supplies will also help water corporations across the region keeping Victorians' water bills affordable.

Where possible, large augmentations will be delayed or avoided, by using integrated water management, in which water corporations, water managers, councils and the Victorian Government collaborate to use stormwater, recycled water and rainwater instead of drinking water for fit-for-purpose uses. Integrated water management will help us meet the region's water needs and build cooler, greener and more liveable communities. New suburbs and developments will be designed to be more water efficient, including using stormwater to irrigate ovals and street trees.

Image: Victorian Desalination Project welcome sign, Bunurong Country

Reducing the region's reliance on river water will, over time, allow urban water corporations to return river water entitlements to Traditional Owners and to the environment. Targets will be set for returning environmental water to major rivers to support critical flows and ensure the survival of native and vulnerable species such as platypus. Environmental water recovery, along with a suite of complementary investments in environmental health — from planting native vegetation along waterways to building infrastructure that helps connect aquatic life, from the mountains to the sea — will enable future generations to enjoy healthy, living rivers and landscapes.

This Strategy is about not only securing the volume of water we need for human and environmental uses, but also protecting the quality of our water supplies. Although our urban supplies are reliably treated to highly stringent safe drinking water standards, the quality of water for agricultural and environmental uses is variable. Reliable water volumes and quality are essential for a productive agricultural sector. They are also essential for healthy rivers and high-quality recreation experiences. This Strategy highlights the importance of sustainable irrigation programs that will protect water and soil quality for farms and support existing measures to reduce pollution in some of our most valuable lakes, estuaries and bays. Increasing the capture and reuse of stormwater also brings significant environmental and water-quality benefits for the receiving creeks and rivers in our urban areas.

This Strategy will not directly affect water prices. Any future price changes will require community consultation by water corporations and approval from Victoria's independent price regulator, the Essential Services Commission. Future water prices will need to balance the cost of providing essential water and sewerage services with the need to keep water bills affordable.

Victorian water bills are already among the lowest in the country. Even with regular desalination orders, Melburnians pay less for water, on average, than do the residents of any other capital city in Australia. Keeping water bills affordable and providing extra support for those who need it most must be at the heart of all decisions on the region's future water supplies. A proposed new Water Supply Readiness Roadmap will plan for careful and sustained increases to water supplies (at small and medium scales) rather than waiting for an emergency such as a severe drought. This will avoid sudden infrastructure investments that result in unplanned increases in water costs. In line with the Victorian Government's commitment of net zero greenhouse gas emissions by 2050, new water supplies will need to use renewable energy, or offset any non-renewable energy used.

The majority of waterways in the region are fully allocated. This means that finding new river water to meet demand is not an option. Although manufacturing more desalinated or recycled water supplies appears to be more costly than taking water from rivers, the latter has hidden costs, such as irreversible harm to environmental, Traditional Owner and social values, that are not fully reflected in current prices. Technological advancements are also reducing the production cost of recycled and desalinated water. Water from rivers is becoming less plentiful as the climate becomes warmer and drier. Continued reliance on water extraction from rivers risks accelerating environmental harm to rivers, lowering water quality, and damaging ecosystem health. In short, river water cannot meet our future needs, and we need diverse alternatives.

The cost of inaction if we do not adapt to the changing climate will far exceed the cost of increasing and strengthening our water supplies. A transition to a climate-resilient water future will protect the region from consequences such as:

- declining water quality and reliability for farmers
- irreversible declines in river health and the loss of plant and fauna species
- job losses and economic harm from severe water restrictions
- sudden bill increases to pay for new supplies during a crisis
- the continuation of water injustice for Traditional Owners
- increased risk of water supply emergencies as a result of bushfires, storms or other extreme weather events.

Proposed directions — at a glance

For **cities and towns** the discussion draft proposes to:

- improve water efficiency (households and commercial/industrial) (see **Chapter 5**)
- develop a Water Supply Readiness Roadmap to identify near-term water supply options (see **Chapter 6**)
- investigate options to ensure that the region's desalination capacity meets future needs (see **Section 7.2**)
- increase use of recycled water and stormwater for non-drinking purposes
- Investigate a large-scale citywide alternative water network, that could supply stormwater and recycled water for non-drinking uses (see **Section 7.6**)
- build community confidence in the safe and suitable use of recycled water and stormwater (see **Section 7.4**)
- review, streamline and update the regulatory framework for recycled water and stormwater (see **Sections 7.7** and **7.8**).

For **agriculture** the discussion draft proposes to:

- improve agricultural water-use efficiency and best-practice land and water management both on-farm and through improvements to rural water infrastructure (see **Section 5.6**)
- identify future agricultural demands for water in Melbourne's green wedges and consider ways to make the most of all sources of water, including recycled water and stormwater (see **Section 7.9**)
- provide access to small volumes of unallocated water (after a portion is made available to Traditional Owners and provision made for any urban water security needs) (see **Section 8.4**)
- help farmers get the most from the water market by improving information, trialling an online water market exchange and making water trade rules more flexible (see **Section 8.6**).
- protect the rights of existing entitlement holders (see **Section 8.1**)

For **Traditional Owners** the discussion draft proposes to:

- make a portion of unallocated water available to Traditional Owners (see **Section 8.4**)
- return river water to Traditional Owners as the use of climate-resilient water supplies increases (see **Section 8.1**)
- explore opportunities to work with water corporations to protect and improve cultural values through the management of water supply systems and waterways for shared benefits (see **Section 8.9**)
- identify opportunities for Registered Aboriginal Parties within the region to have a 'seat at the table' and a say in all aspects of water management through the implementation of this strategy (see **Chapters 6** and **13**).

For the **environment** the discussion draft:

- identifies the volumes of water that need to be returned to rivers to prevent critical species loss and make waterway health improvements in the near term as well the long-term volumes required for resilience to climate change (see **Chapters 10, 11** and **12**)
- proposes various options to meet these water recovery targets, but most rely on the investment in new manufactured water supplies for consumptive uses to enable river water to be returned by substitution (see **Section 8.1** and **Chapters 10, 11** and **12**)
- proposes to develop and release, by 2022, statewide guidelines for using recycled water for environmental release into waterways (see **Section 7.10**)
- proposes complementary works to achieve the best possible environmental outcomes from any water recovery or improvements in flow regimes (see **Chapters 10, 11** and **12**).

1. What is the Central and Gippsland Region Sustainable Water Strategy?

Image: Sale Common wetlands, Gunaikurnai Country

1.1 The Central and Gippsland Region

The Central and Gippsland Region covers the waterways and catchments relied on by Victorians south of the Great Dividing Range, right down to the coast, and from the Otway Ranges in the west to Mallacoota in the east. This region is essential to the state's liveability, sustainability and prosperity, as more than 6.2 million Victorians currently depend on its rivers, wetlands and lakes to live, work and play. As well as providing habitat for native wildlife, the region accounts for almost a third of Victoria's dairy production and more than a quarter of the state's beef and vegetable produce. The Traditional Owners and original custodians of the land and waters across this region are the Bunurong, Eastern Maar, Gunaikurnai, Wadawurrung and Wurundjeri Woi-wurrung peoples **Figure 1.1**.

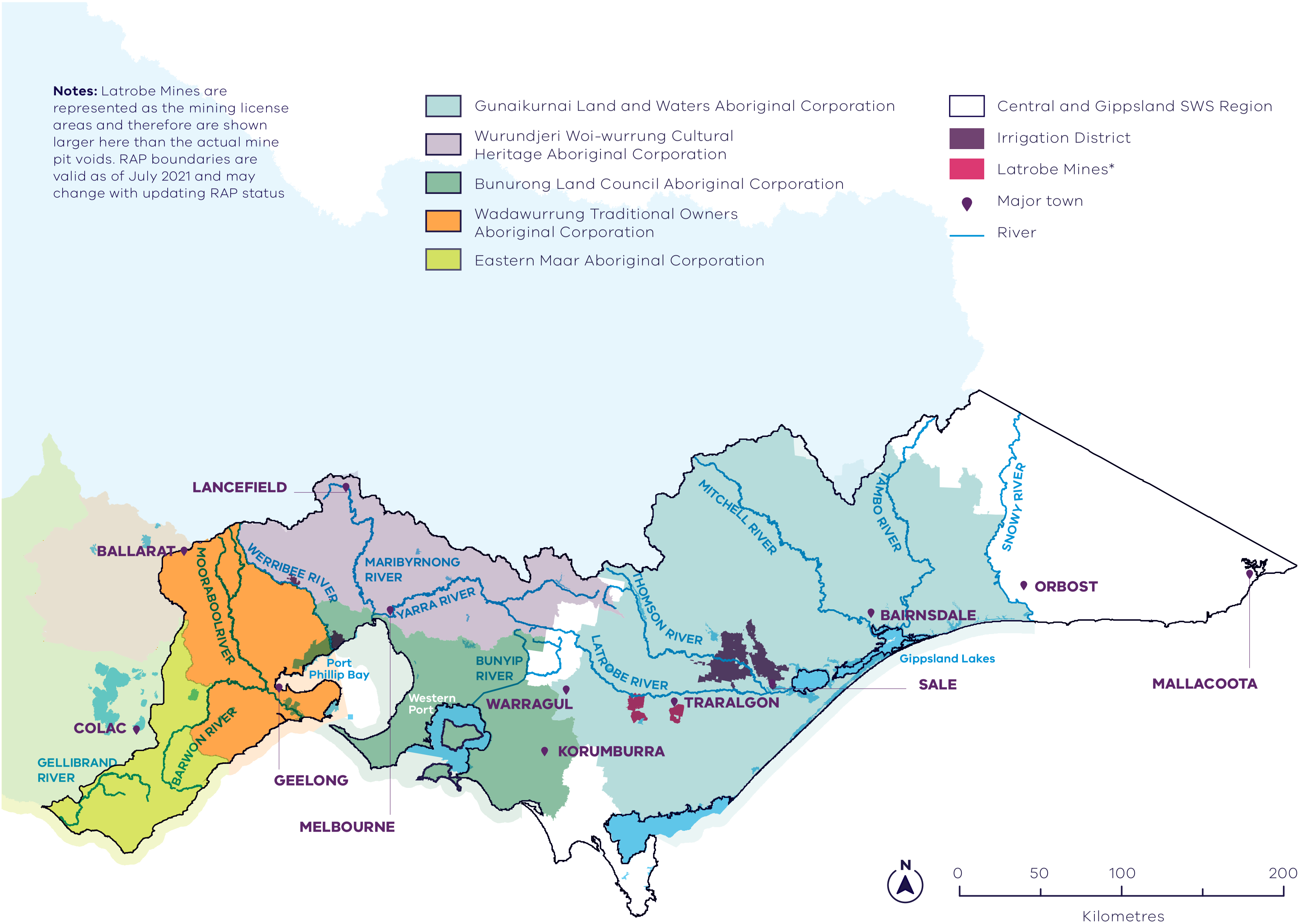


Figure 1.1: The Central and Gippsland SWS Region and major waterways covered by this Strategy and the Registered Aboriginal Parties (RAPs) in the region. The RAP boundaries are current at 30 June 2021, and will be updated to reflect changes to RAP boundaries in effect from 1 July 2021

Waterways and water bodies in the region are highly valued by Victorians for the wide range of recreational activities they offer and their contribution to the health, wellbeing and social fabric of communities. They also support tourism and provide important economic benefits to Victoria.

1.2 Our water challenges

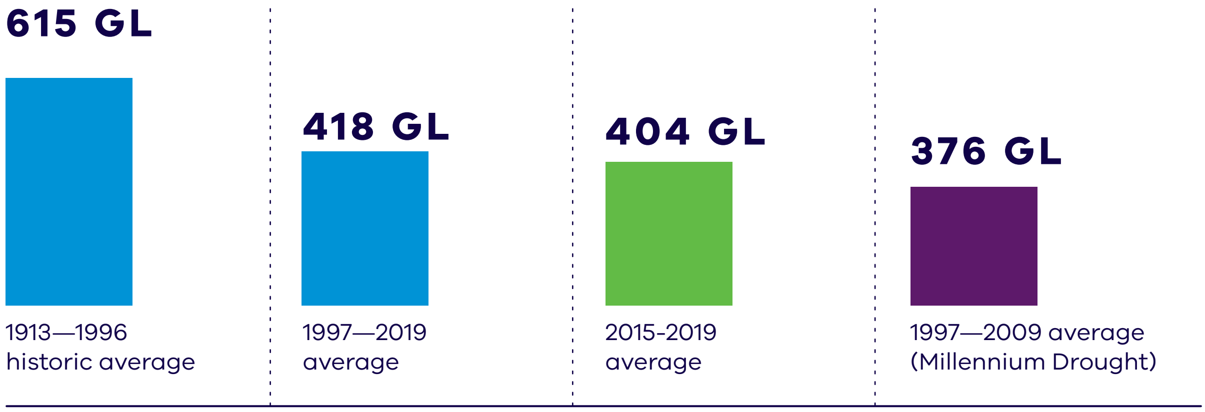
Over the past century, our rivers and dams have provided safe, reliable and affordable water supplies for the Central and Gippsland Region. The region's water supply system was severely affected by the Millennium Drought from 1997 to 2009, when Melbourne's dam levels dropped to a critical low of 25 per cent of capacity, and severe water restrictions were enforced in many towns. Households, businesses and industry responded to calls to save water, and consumption was cut by about a third in Melbourne between 1997 and 2009 (Melbourne Water, 2017). In 2008, the Victorian Government introduced the Target 155 program, encouraging daily water consumption of no more than 155 litres per person in metropolitan Melbourne.

With the region's water storages receding, the Millennium Drought showed the need for a diversified water supply system. Building more dams wasn't the solution. Sites suitable for new dams had been exhausted, and long-term declines in average rainfall meant that, in the future, there wouldn't be enough rain to fill them. To secure Melbourne's water supplies, a new, rainfall-independent water source was built: the Victorian Desalination Project at Wonthaggi. To share the benefits of desalination across the region, many regional towns, including Geelong, Cowes and Wonthaggi, were connected to the Melbourne system through the water grid.

Although water efficiency and desalination helped to secure the region's water supplies, significant population growth and a long-term trend of declining rainfall have continued to increase the demand for water. The region's population has grown by about 1.8 million people since 2006, reaching 6.2 million in 2021, and is expected to exceed 10 million by 2056 (DELWP, 2019a). Melbourne's total annual water consumption is outstripping average annual inflows by around 70 gigalitres, with desalinated water orders filling the gap. Demand is already outstripping local supply for the rapidly growing towns of Warragul and Drouin, which rely on temporary arrangements to obtain water from the Tarago System for their water security.

While the region's water demands are growing, long-term projections show a trend towards warmer and drier conditions, with less rainfall on average and more variability year to year. As a result, the amount of water flowing into rivers and dams (streamflow), which we rely on to refill water storages, is declining. Streamflow has declined by as much as 21 per cent over the past 10 to 15 years across the Central and Gippsland Region, and this is expected to continue. Streamflows throughout the region are projected to decline by a further 8 to 22 per cent by 2065 under a medium climate change scenario, or by up to 40 per cent under a high climate change scenario.

MELBOURNE STORAGES: BY THE NUMBERS



463 GL
2019 inflow into Melbourne storages

25%↓
2019 inflow 25% below historic average (1913-1996)

18/20
Melbourne storages have received below historic average inflows in 18 of the last 20 years

Figure 1.2: Declining inflows to Melbourne water storages, to 2019

Because there are more people and less water in the region's rivers and dams, the Victorian Desalination Project is no longer just required in drought years. Since 2016, annual desalinated water orders have supplied the equivalent of more than 20 per cent of Melbourne's storages. For the past three years, 125 gigalitres of desalinated water was ordered, out of a maximum of 150 gigalitres, leaving little capacity to respond to a water supply emergency such as a prolonged or severe drought. Modelling shows that, even without a drought, and with the Victorian Desalination Project operating at full capacity, Melbourne and Geelong could experience water shortages within this decade.

Our reliance on rivers and dams to provide most of our water supplies has come at a cost to the environment and to Traditional Owners, and has also affected recreational uses of waterways. There is less water in our rivers, and we have seen declines in river health. Long-term water availability for the environment is declining — even more than for consumptive uses — in many river basins in the region (DELWP, 2020a). Significant additional volumes of environmental water are required if we are to avoid irreversible declines in river health and ensure the survival of native species and the health of water ecosystems. Declining water availability also diminishes the recreational use and enjoyment of the region's rivers, creeks and lakes. Low water flows during dry summers and droughts, and algal blooms, can lead to the closure of waterways for public use or fishing and the cancellation of major water sport events.

Years of drought and bushfires combined with drying conditions mean that farmers need more water for dryland enterprises and irrigated production, yet most of the region's river water and groundwater is fully allocated. Global demand for water-intensive foods is also increasing. While recycled water can provide some farmers with a large source of (mainly) rainfall-independent water, uptake to date has been low because of the costs. In some cases, variability of water quality, including salinity, limits the types of crops that can be irrigated with recycled water. To shift to a future with less available water and higher demand for agricultural products, farming communities need fit-for-purpose and cost-effective recycled water schemes, as well as other sources, to maintain productivity.

Traditional Owners have never ceded rights to water across Victoria, yet Aboriginal people hold less than 0.1 per cent of water rights in this state. This exclusion denies Traditional Owners the right to care for Country — the essence of Aboriginal social, spiritual, economic and physical wellbeing, and the basis of cultural lore. How water is shared and managed in the future needs to redress these historical injustices.

This Strategy is a once-in-a-decade opportunity to meet these challenges of declining water availability and increasing demands as our population grows. Everyone across the region relies on water, and we all have a role to play in ensuring that it is used efficiently and managed fairly and sustainably, in order to maintain a reliable, high-quality and affordable water supply that can support the region's many water needs and values for generations to come.

1.3 Purpose of the Sustainable Water Strategy

Sustainable Water Strategies are plans to secure the future water needs of Victoria's regions. They take a long-term view — the next 50 years — and must be reviewed after 10 years.

The legislative requirements for a Sustainable Water Strategy are summarised in **Table 1.1**.

Table 1.1: Legislative requirements of Sustainable Water Strategies under Victoria's *Water Act 1989*

✓	Identify threats to the reliability of supply and quality of water for both environmental and consumptive uses in the region.
✓	Identify ways to improve and set priorities for improving reliability of supply and quality of water, including managing demand for water and investing in infrastructure for the supply of recycled water.
✓	Identify ways to improve and set priorities for improving the maintenance of the Environmental Water Reserve in accordance with the Environmental Water Reserve objective.
✓	Identify ways to increase and set priorities for increasing the volume of water in the Environmental Water Reserve to improve the environmental values and health of water ecosystems.
✓	Include an implementation plan, setting out timelines or targets for implementing key actions identified by the strategy.
✓	Consider opportunities to provide for Aboriginal cultural values and uses of waterways, as well as for the social and recreational uses and values of waterways, in the region to which the strategy applies.
✓	Take into account any determination of native title in relation to the region to which the strategy applies.
✓	Have regard to any relevant economic and environmental matters.
✓	Take into account the Long-Term Water Resource Assessment findings that relate to the region.

Sustainable Water Strategies have been completed separately for the Central Region (in 2006) and the Gippsland Region (in 2011). While the two regions' water supplies have been intertwined since the Thomson Dam was completed in 1984 as a major addition to Melbourne's water supply, the interconnections between the two regions' water supplies have increased significantly over the past decade. Since the Millennium Drought, additional water grid connections have been built from the Melbourne supply system to cities and towns across the region, including Geelong, Korumburra, Cowes and Wonthaggi. The Long-Term Water Resource Assessment completed in 2020 for southern Victoria found that seven river basins required further consideration of the balance between environmental and consumptive use; five of these are in the Central Region and the other two are in the Gippsland Region. For these reasons, the two regions' water security is being considered in a single Sustainable Water Strategy.

1.4 Developing the Sustainable Water Strategy

The Victorian Government is developing this Strategy in partnership with water corporations, catchment management authorities, Traditional Owner groups from across the region and the Victorian Environmental Water Holder. Representatives from these groups and authorities are providing input through a consultative committee (**Table B.1**). Overseeing the development of the Strategy is an independent panel with a focus on community engagement and the incorporation of community feedback into the final Strategy (**Appendix B**).

Pupangarli Marnmarnepu

In line with the Victorian Aboriginal Affairs Framework 2018–2023 and the Department of Environment, Land, Water and Planning's commitment to Pupangarli Marnmarnepu, 'Owning Our Future', the Strategy will enable the self-determination of Traditional Owners by recognising and implementing their decisions on the sustainable management of water resources on their Country. The Strategy was developed with the following Registered Aboriginal Parties in the region:

- Bunurong Land Council Aboriginal Corporation
- Gunaikurnai Land and Waters Aboriginal Corporation
- Wadawurrung Traditional Owners Aboriginal Corporation
- Wurundjeri Woi-wurrung Cultural Heritage Aboriginal Corporation.

These groups form the Central and Gippsland Region Traditional Owner Partnership.

The Eastern Maar Aboriginal Corporation was also invited to collaborate with the Department of Environment, Land, Water and Planning in the development of the draft Strategy, but have self-determined to participate in waterway management and planning through other processes at this time.

This discussion draft Strategy is just the start of the conversation. The Victorian Government is inviting you and communities across the region to help shape the future by reading the draft Strategy and giving us your feedback. We will listen to your comments, priorities, and concerns before finalising the Strategy and an implementation plan, which will be released in 2022. You can read more about how the Strategy is being developed in **Chapter 13**. To find out how you can join the conversation, refer to *Join the Conversation* at the start of this document.

Proposed vision

The consultative committee has developed this draft vision for the water future of the Central and Gippsland Region. The region will work together to:

> *Ensure our waterways and aquifers can support a healthy environment and regional prosperity for current and future generations, where the water needs of our cities and towns, Traditional Owners and the environment are met — even as the climate becomes drier and more variable — and where agricultural, industrial and recreational activities can thrive.*

Guiding the Strategy's development is a commitment to:

Explore options

- The Strategy will openly explore the options available to meet the range of water needs, as well as their costs, benefits and risks.
- The best available knowledge, including Traditional Owner Knowledge, will inform robust and adaptive strategy actions that are supported by monitoring and evaluation.
- Decisions about significant infrastructure will seek to maximise overall community benefit and be based on robust analysis of the opportunities and impacts from economic, environmental, Traditional Owner and social values perspectives.

Include Traditional Owners

- Traditional Owners are partners in the development, adaptation and implementation of Strategy actions.
- Decision-making will support Traditional Owners' rights on Country so that their objectives for people, land, water and culture are realised.
- A restorative justice approach should be adopted to elevate the rights of Traditional Owners.
- Traditional Owners will determine the use and application of water that they own.

Seek community input

- Community feedback will inform the direction of the final Strategy.
- All stakeholders will be treated equitably.
- Proposed actions that will lead to material increases in water price for customers will be identified so that community feedback on willingness to pay can be sought.

Address the findings of the Long-Term Water Resource Assessment

- The Strategy will be transparent about how it has addressed the findings of the Long-Term Water Resource Assessment (see **Appendix C**).

1.5 Proposed vision and objectives

Figure 1.3 shows our proposed vision for meeting the major water challenges in the Central and Gippsland Region.

VISION:
The region will work together to ensure our waterways and aquifers can support a healthy environment and regional prosperity for current and future generations, where the water needs of our cities and towns, Traditional Owners and the environment are met — even as the climate becomes drier and more variable — and where agricultural, industrial and recreational activities can thrive.

THIS DRAFT STRATEGY PRESENTS HOW WE PROPOSE TO:

- Understand the challenges facing the region
  Chapters 2 and 3
- Support *Healthy Country, Healthy Mob* through partnership with Traditional Owners
  Chapter 4
- Save water by being as efficient as possible
  Chapter 5
- Determine how to grow water supplies to add to our 'bucket'
  Chapter 6
- Maximise the use of all sources of water
  Chapter 7
- Share and manage water equitably between all uses
  Chapter 8
- Determine how we will invest to secure our water supplies and who will pay
  Chapter 9
- And identify which problems have local solutions
  Chapters 10, 11 and 12

Figure 1.3: How the draft Strategy proposes to achieve the vision for the region

The following proposed objectives describe how this vision will be achieved:

- Set out a Water Supply Readiness Roadmap, to use all sources of water as efficiently as possible and identify options for increasing water supply.
- Identify how water will be returned to Traditional Owners.
- Identify ways to maintain and improve waterway health.
- Identify ways to build the resilience of agriculture to a drying and varying climate.
- Identify opportunities to provide for social and recreational uses and values of waterways.

Image: Walker along path beside the Yarra River, Melbourne CBD, Wurundjeri Woi-wurrung Country

2. Water sources — now and in the future

Image: Moondarra reservoir

At a glance

- The Central and Gippsland Region currently relies on river water — water that flows through rivers, creeks and reservoirs — to meet around 90 per cent of its water needs.
- Our drying climate means that less water is flowing into our rivers and less water can be captured in our storages. The Long-Term Water Resource Assessment showed that river water across the region has already declined by as much as 21 per cent. Streamflows throughout the region are projected to decline by a further 8 to 22 per cent by 2065 under a medium climate change scenario.
- Only a small volume of additional water can be taken from rivers and groundwater at some isolated locations in the region without impacting existing users or harming the environment.
- The level of use of recycled water in Victoria has remained largely constant over the past 10 years, despite increased production. The majority of this water, after being treated to applicable environmental standards, is discharged into our waterways, the bays or the ocean.
- Stormwater harvesting schemes in the region are currently relatively small and often part of new urban developments, so the majority of stormwater across the region drains to local waterways.
- As our cities and towns grow, more stormwater and recycled water will be produced and available for suitable purposes.
- The region already relies on using the Victorian Desalination Project to supplement climate-dependent water supplies.

2.1 Mix of sources

The water needs of the Central and Gippsland Region are mostly met by river water — water that flows through rivers, creeks and into our storages, also known as our dams and reservoirs. Rivers currently provide around 90 per cent of our water needs. Melbourne and the surrounding region now rely on water from the Victorian Desalination Project, which can supply about one-third of Melbourne's annual water use (Melbourne Water, 2021a). Recycled water, stormwater and groundwater are currently a smaller but integral part of our water supplies (**Figure 2.1**). Rivers, presently the main source of our water supplies, are climate-dependent (**Figure 2.2**), meaning that they rely on rainfall. Climate-dependent sources of water are affected by climate variability and change.

As in other parts of southern Australia, the climate in the Central and Gippsland Region is highly variable, and will continue to be so into the future. The Millennium Drought (1997–2009), the Victorian floods of 2010–11 and the more recent drought in parts of Gippsland are clear examples of climate variability.

The trend in recent decades is towards warmer and drier conditions. Historically, rainfalls in the cool season have provided most of the run-off to Victoria's rivers, filling water storages and providing environmental flows. However, during the Millennium Drought, rainfalls in the cool season (April–October) were the lowest on record when averaged across the state, and have remained low ever since (DELWP, et al., 2020). Although Victoria's climate and streamflow will always vary greatly, the chances of experiencing warmer conditions and less streamflow are now higher than in past decades.

The Victorian Government is working with scientists to continue to improve our understanding of the effects of climate change on the state's water resources. Research is focused on understanding how rainfall — the single biggest factor influencing water availability — is affected by climate change. Further information about climate change in the region is included in **Appendix D**.

River water is becoming less and less reliable, so we need diverse alternatives, including supplies that are more climate resilient — those that either rely only indirectly on rainfall, or do not rely on rainfall at all.

Victoria's water in a changing climate

The Victorian Water and Climate Initiative (2017–21) was a four-year research collaboration between the Victorian Government, Bureau of Meteorology, CSIRO and the University of Melbourne, which investigated Victoria's changing climate and hydrology, as well as its water future.

Its major findings include:

- Declines in rainfall during the April–October cool season would likely not have been as large without the influence of increased levels of atmospheric greenhouse gases.
- Average catchment run-off has declined since 1997, largely due to reduced rainfall, with declines in run-off in many catchments in central and western Victoria greater than expected.
- Individual catchments can respond to and recover from drought in unique ways, and differ in their resilience or vulnerability to drought. During the Millennium Drought, more than half of the Victorian catchments that were analysed had an extra 20 to 40 per cent decline in their annual streamflow due to shifts in the rainfall–run-off relationship, in addition to the reduction that could be explained by the decline in annual rainfall.
- Analysis of climate models has improved our understanding of how our water resources can be affected by a variety of different climate scenarios, including those in which we meet our global emission reduction targets.

The full report is available online: **www.water.vic.gov.au/vicwaci**

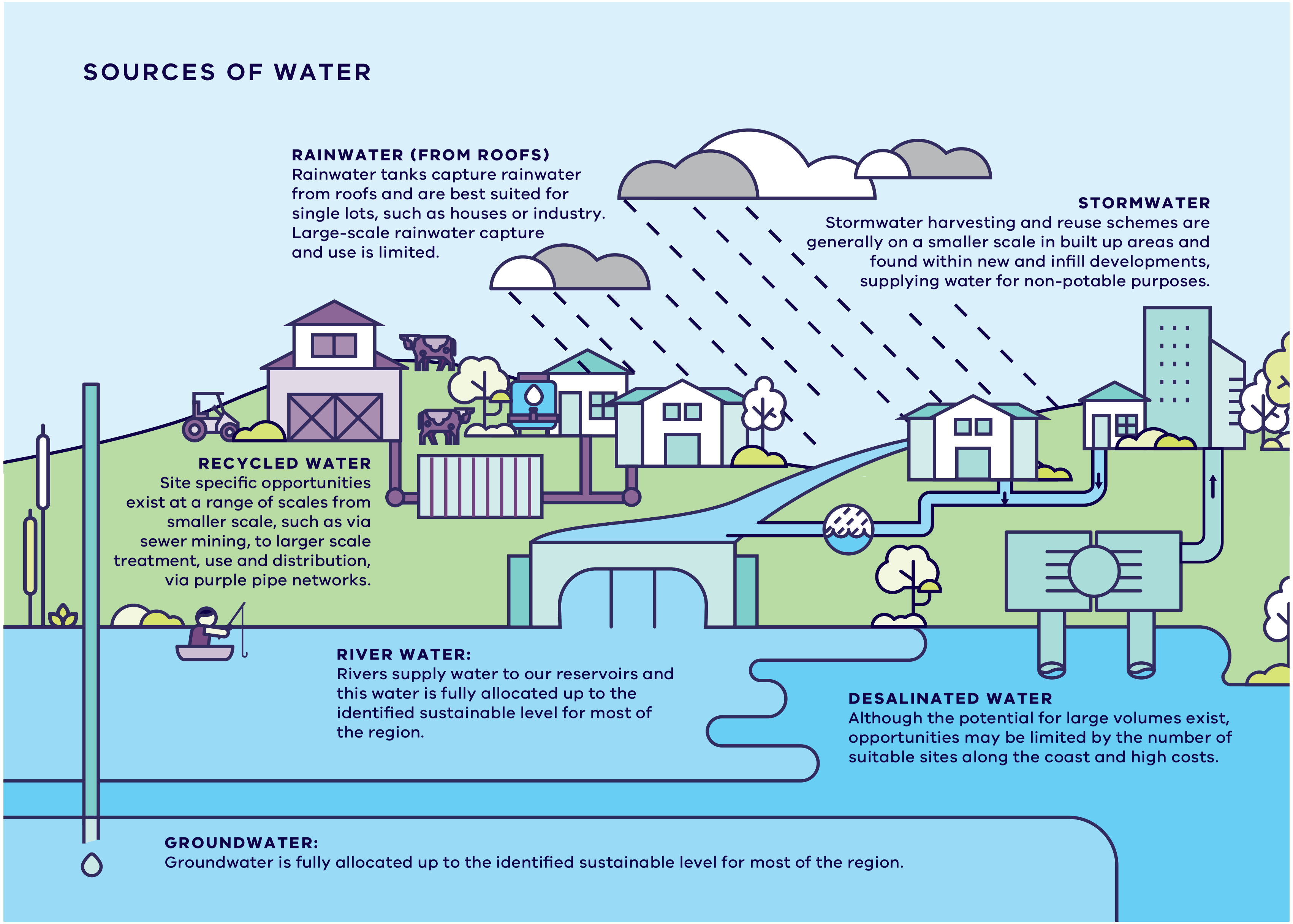


Figure 2.1: Sources of water for different needs, and opportunities for meeting demand

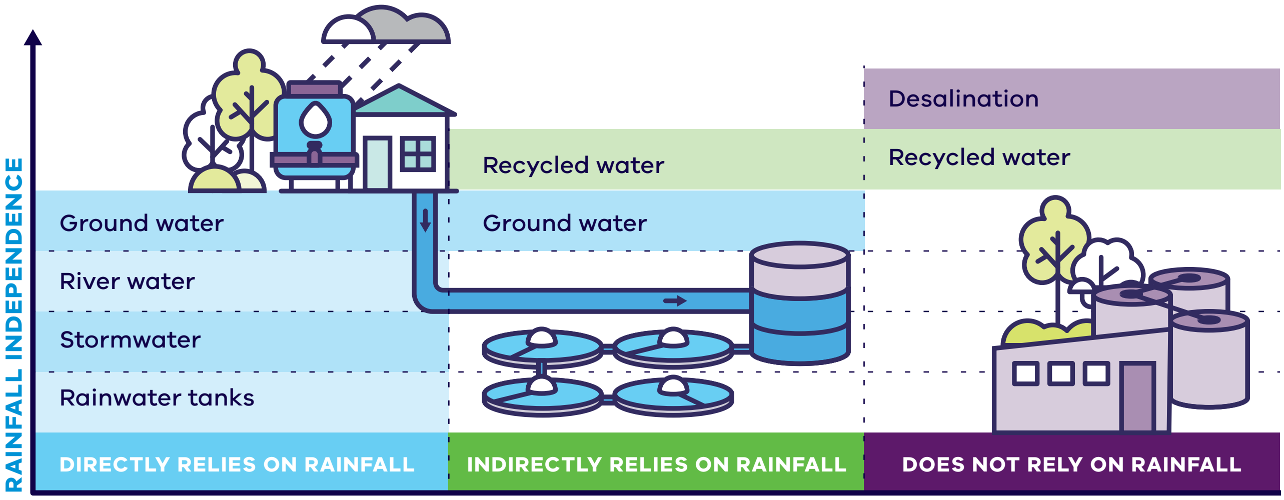


Figure 2.2: Rainfall dependencies of different water sources (based on WSAA (2020), Figure 5)

2.2 River water

River water is the main source of water for people, industry and farms in Victoria. It is essential for the health of waterways, and is critical for Traditional Owners. Also, it provides the basis for many recreational activities, including those that bring the economic benefits of tourism.

River basins with headwaters in the Victorian Alps have the most available river water (**Figure 2.3**). The basins with the least water available naturally are those to the west of Melbourne; they are in a rain shadow created by the Otway Ranges.

Image: Macalister River, Maffra West Upper, Gunaikurnai Country

Note* percentage decline was not assessed for Phillip Island as part of the Long-Term Water Resource Assessment

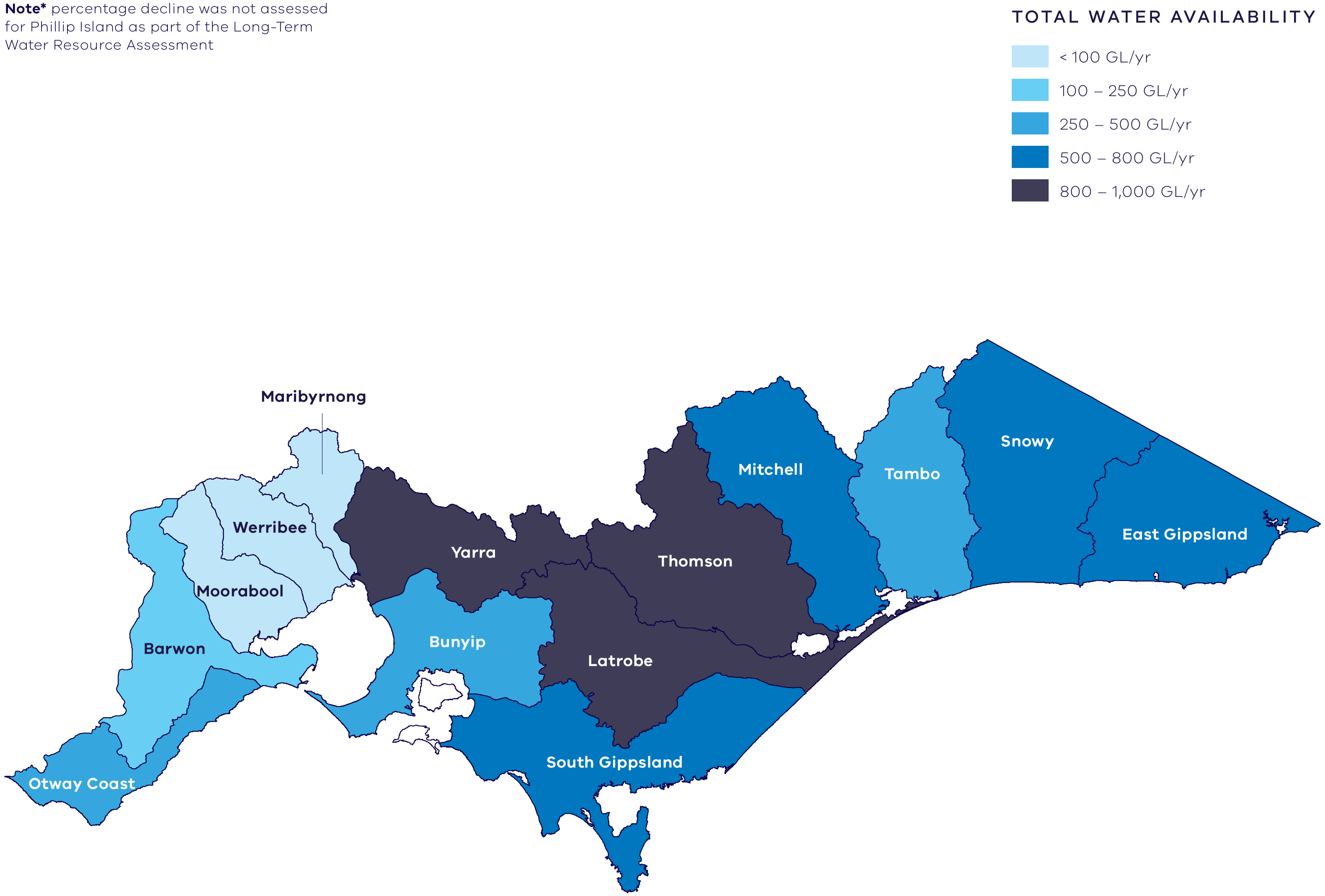


Figure 2.3: Average annual surface water available in each river basin across the Central and Gippsland Region

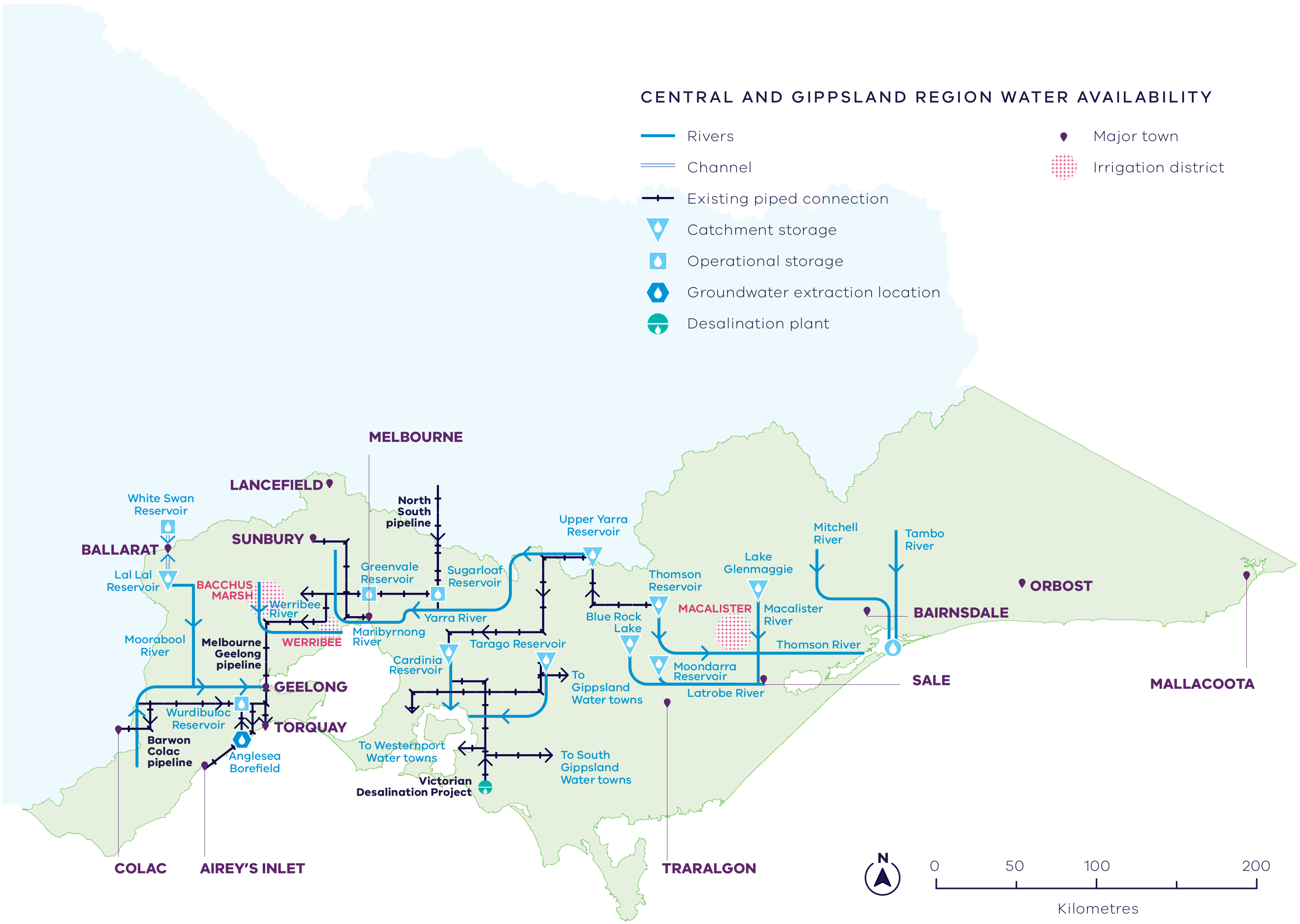


Figure 2.4: Victoria's connected water grid in the Central and Gippsland Region

Water sources are connected to Victorian communities through the Victorian water grid (**Figure 2.4**). Much like our road network, dams and reservoirs (which collect and store river water), irrigation districts and the desalination plant are connected via infrastructure including pipes, pumps and natural elements such as rivers.

River water availability is declining overall, due to decades of typically drier, warmer conditions. The Long-Term Water Resource Assessment showed that river water across the region has declined by as much as 21 per cent (DELWP, 2020b). Current long-term estimates of water availability are lower than when it was last estimated for previous Sustainable Water Strategies.[1] **Figure 2.5** shows that the largest percentage declines have been in the basins located to the west of Melbourne

1 Current long-term water availability was calculated as the average since 1975. Calculations of long-term water availability for the previous Sustainable Water Strategies used all available historical data (back to the 1890s for some rivers) to calculate the long-term average. The period since 1978 better reflects our current climate than does the full historical record (DELWP, 2020b).

Image: Darebin Creek, Darebin Parklands, Wurundjeri Woi-wurrung Country

Note* percentage decline was not assessed for Phillip Island as part of the Long-Term Water Resource Assessment

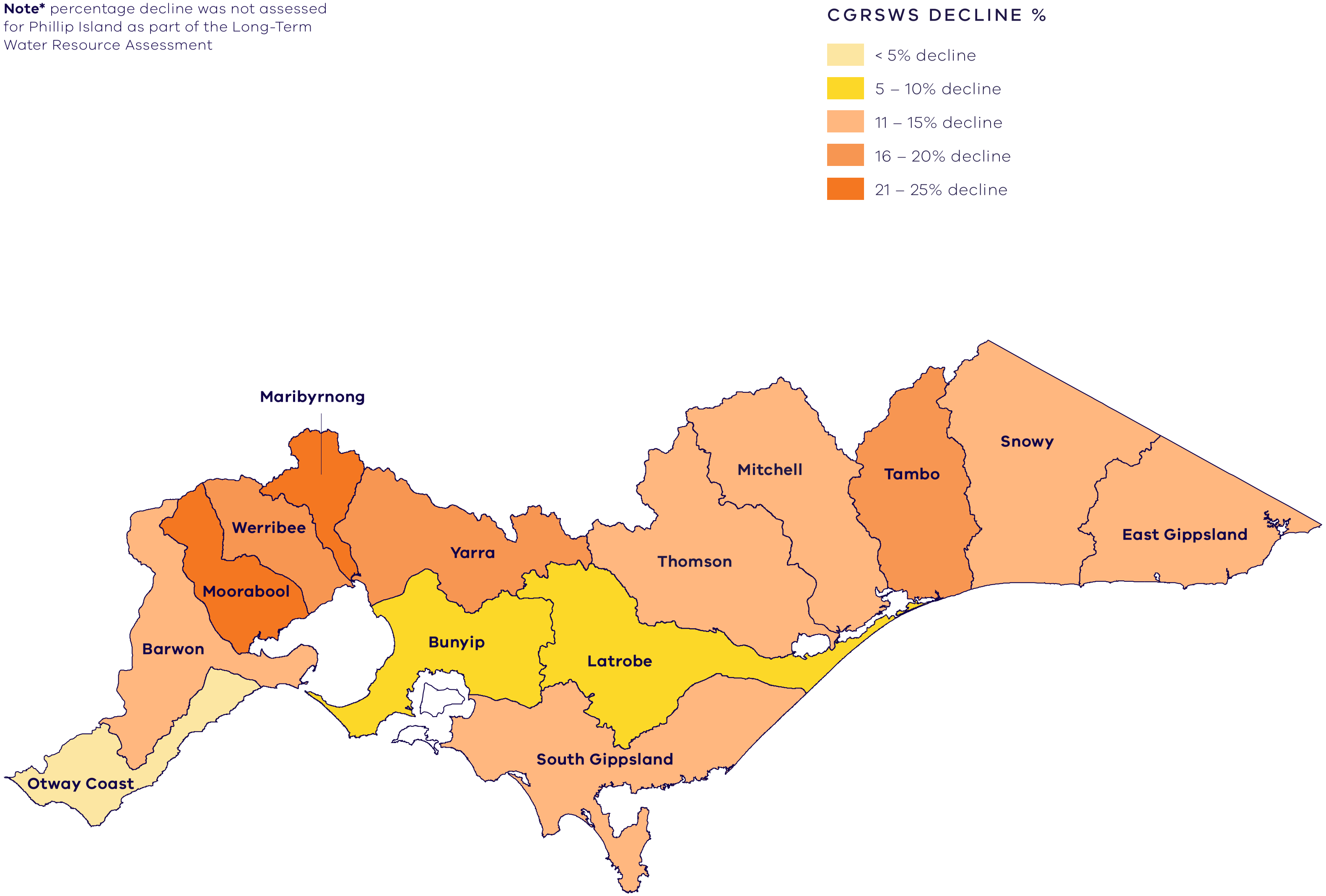


Figure 2.5: Percentage decline in surface water availability in each river basin across the Central and Gippsland Region for 1975–2020, relative to the long-term record

Although we know that climate change is playing a role in our climate and water resource position today, there is uncertainty about how much it has influenced the observed dry conditions since 1997. It is possible that the reductions in rainfall and water availability we are already experiencing are significantly greater than those shown in **Figure 2.5**, which were based on the period post-1975. For example, the Long-Term Water Resource Assessment found declines of 5 per cent in the Latrobe River since 1975, but a 25 per cent reduction compared to this river's long-term average has occurred since 1997.

We need to prepare now for a range of future climate conditions, and consider several possible future climate scenarios. The scenarios used for this Strategy for high, medium and low climate change are based on climate projections derived from 42 global climate models. These models are used by scientists to predict the potential effects of different scenarios — including scenarios of greenhouse gas emissions and concentrations over time — on the earth's atmosphere, oceans and land.

The medium climate change scenario represents the median (50th percentile) rainfall response from the 42 global climate models projections, while the low- and high-impact scenarios represent the wetter (10th percentile) and drier (90th percentile) rainfall responses respectively. Further details about how the future climate scenarios were derived are provided in **Appendix D**.

Figure 2.6 shows the average water availability since 1975 and 1997, as well as the projected total of the average inflows in basins across the entire Central and Gippsland Region under scenarios of low, medium and high climate change for 2065. Streamflows throughout the region are projected to decline by about 8 to 22 per cent under a medium climate change scenario by 2065.

It is also possible that, rather than undergoing a gradual drying trend, our streamflows might have undergone a step change, such that drier conditions since 1997 are here to stay. This step change is another possible future scenario shown in **Figure 2.6**.

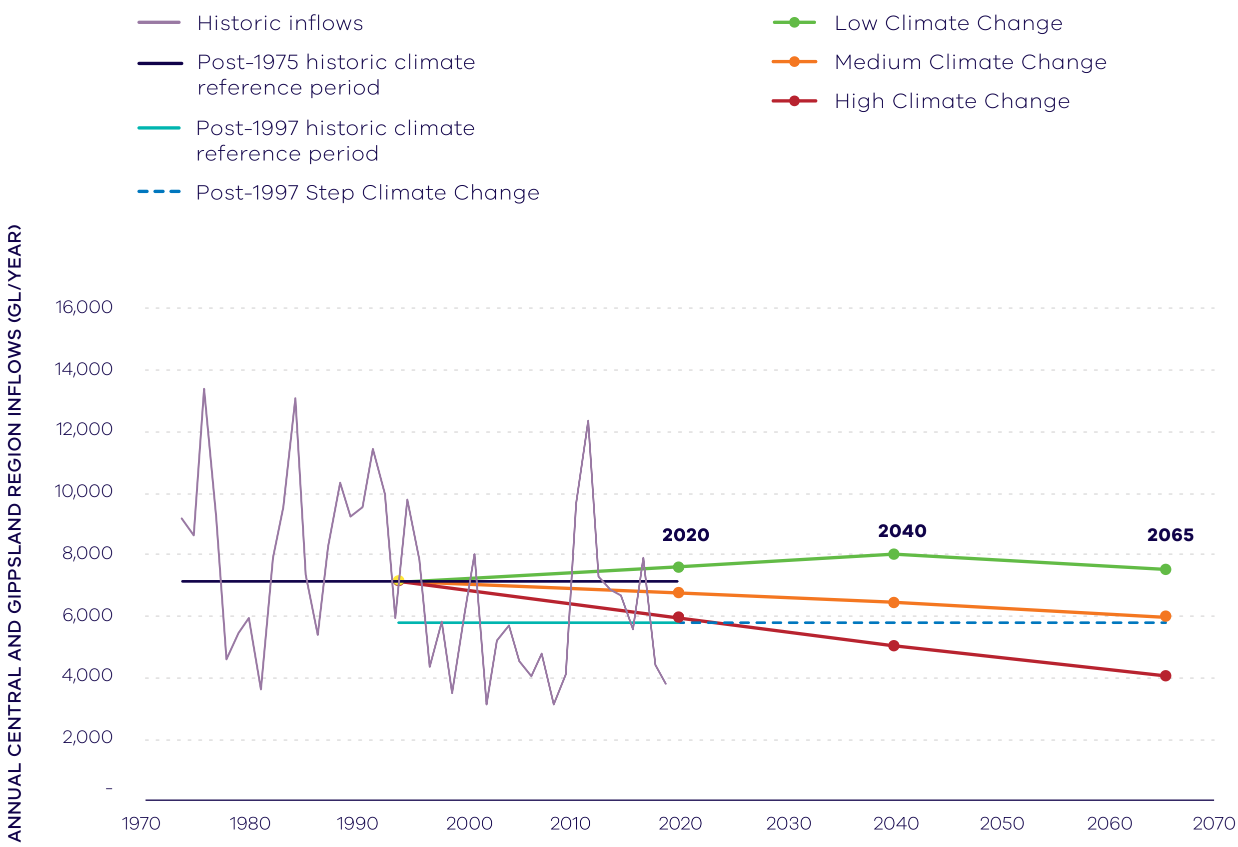


Figure 2.6: Total average annual inflows in the Central and Gippsland Region, current and projected to 2065 under low, medium and high climate change scenarios, and a post-1997 step climate change scenario (see **Appendix D** for more information)

Figure 2.7 shows that, under the high climate change scenario, reductions in streamflow are projected to be highest in the western and central river basins. These basins are already experiencing the greatest declines in water availability — they include the Yarra, Maribyrnong, Werribee, Moorabool and Barwon, with reductions as severe as 44 to 55 per cent projected for 2065. The remaining basins, in the east of the region, are projected to have lesser reductions, generally between 36 and 42 per cent, under the high climate change scenario (Potter et al., 2016).

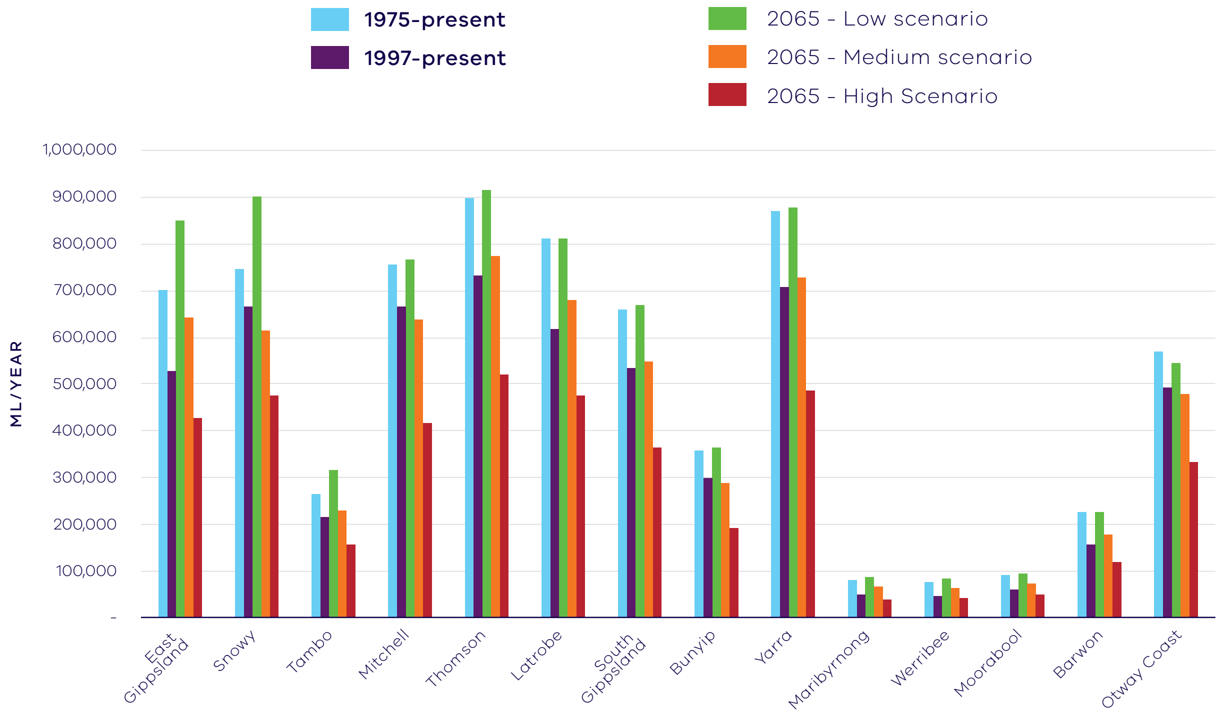


Figure 2.7: Water availability projections for low, medium and high climate change scenarios for 2065, assuming little curbing of greenhouse gas emissions, compared to average annual inflows for two historical reference periods (1975–present and 1997–present)

Together, the low, medium and high climate change and post-1997 step climate change scenarios illustrate a plausible range of future conditions (shown as an annual average). In combination with the increasing influence of climate change, climate variability will continue to result in wide year-to-year variations in climate and streamflow, with an increasing likelihood of many types of extreme climate events such as drought and flash floods. For most basins, water availability since 1997 is less than that expected by 2065 for medium climate change. Some of this historical decline is likely to be caused by natural climate variability. However, the decline in cool-season rainfall in recent decades is unlikely to have been as large without the influence of increasing levels of atmospheric greenhouse gases. This demonstrates that the effects of climate change are being experienced now and that a return to the post-1975 climate over the long term (or a low climate change future) is unlikely.

The volume of water allocated for consumptive use varies significantly between systems across the region. There are caps, or limits, on the amount of water that can be taken from each river basin. These caps are put in place to limit harm from over-allocation of water (such as reduced security of water supply, reduced baseflows in waterways, or declines in water quality from salinity). Most river basins in the region are fully allocated and there is limited potential to allocate more water. Less than 0.3 per cent (about 18.5 gigalitres) of river water is unallocated in the region (**Figure 2.8**). **Section 8.4** sets out how future decisions about unallocated water will be made.

Notes: The volume of unallocated surface water is the total volume of unallocated water available across the catchment area. The distribution of available water within each catchment will vary, and a local assessment is required to determine if there is any unallocated water available at any particular location.

For catchments in the CGRSWS area that were outside of the 2011 Gippsland and Western Region Sustainable Water Strategy areas, including the Bass River and Lang Lang River catchments, the volumes of unallocated surface water available have been revised consistent with the approach taken in the 2011 strategies. This includes consideration of the risks posed by climate change, and a range of sustainability principles (refer to Policy 3.1 of the 2011 Gippsland Region Sustainable Water Strategy). The revised volume available is 300ML in the Bass River catchment, 200ML for French Island and 100ML for the coastal catchment between Lang Lang River and Bass River catchments. The revised volume available in the Lang Lang River catchment is proposed to be 500ML.

UNALLOCATED SURFACE WATER

1 – 100 ML

101 – 300 ML

301 – 999 ML

1,000 – 2,500 ML

500 ML
Total unallocated water across all other Far East Gippsland catchments.

500 ML
Total unallocated water across all other South Gippsland catchments.

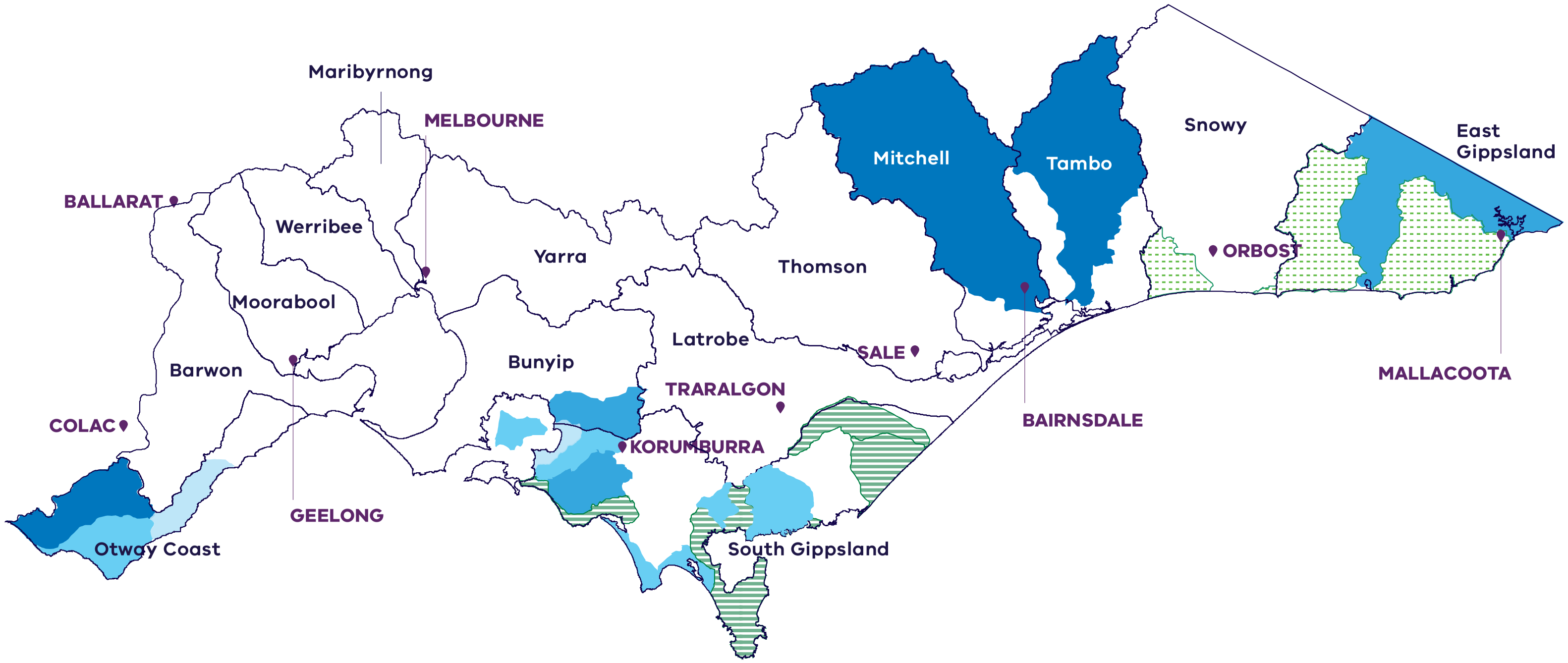


Figure 2.8: Unallocated surface water in each river basin across the Central and Gippsland Region

2.3 Groundwater

Groundwater is water that is stored in aquifers. An aquifer is an underground layer of rock or unconsolidated material — gravel, sand or silt — that can store and yield very large volumes of usable water. Groundwater can be extracted via bores using pumping systems. The amount of groundwater that is available depends on how much water seeps into (recharges) the aquifers, and how much of it moves through the aquifers, being released into streams, wetlands and the sea.

Climate can affect rates of groundwater recharge and availability. Climate tends to influence groundwater availability over timeframes that are longer than those for river water. Not all groundwater systems are affected by changes in climate, especially groundwater in confined aquifers that are unconnected to the surface and where water flow between aquifers is the dominant means of recharge.

Long-term groundwater availability has declined in some areas of southern Victoria. This has had little effect on consumptive uses. Groundwater extraction has had only a very small effect on water availability for the environment at the regional level, compared to other influences such as climate change (DELWP, 2020a). The consequences for waterways of groundwater extraction can be more significant at local scales, particularly during periods of low flow when baseflows sustain flow in certain reaches of a river or wetland. These effects are managed through existing processes that aim to minimise disadvantage to third parties (such as other groundwater users) and harm to the environment.[2]

Groundwater use is capped and fully allocated in most areas of the region (**Figure 2.9**). Less than 6 per cent (about 14 gigalitres) of groundwater is unallocated in the region. The Victorian Government will work with water corporations, catchment management authorities, Traditional Owner partners and key stakeholders to improve groundwater management, as Victoria faces a drying climate.

2 These processes include individual assessment of groundwater licence applications, and development of groundwater management plans in consultation with groundwater users and stakeholder groups.

Image: Seagulls fly over Lake Guthridge, Sale, Gunaikurnai Country

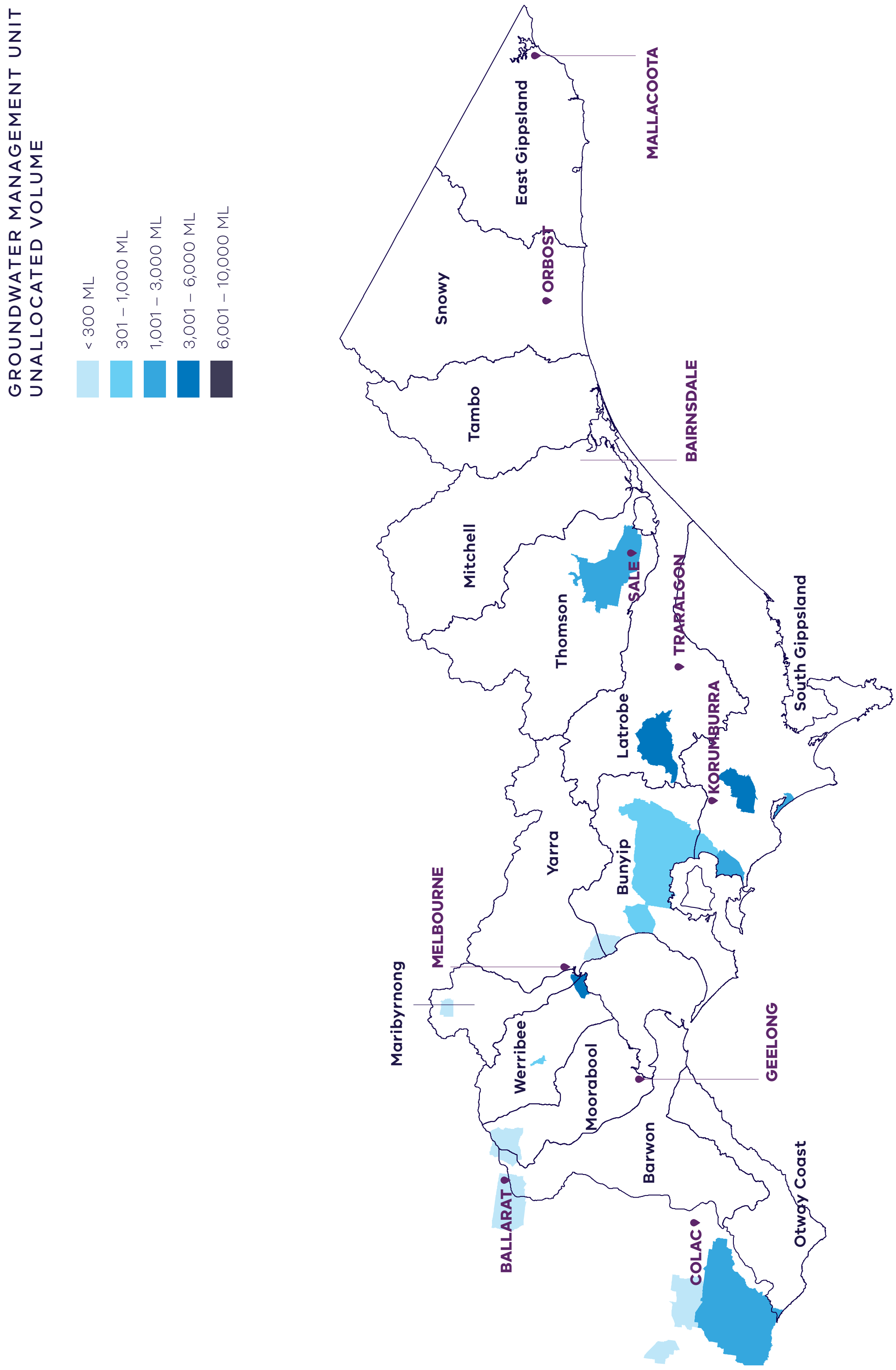


Figure 2.9: Unallocated groundwater (groundwater management units, GMU) in each river basin across the Central and Gippsland Region

2.4 Rainwater (via tanks)

Rainwater is the main source of water for people outside urban areas and is the primary source of water for dryland agriculture, complemented in some cases by recycled and bore water.

In urban areas, rainwater, captured in rainwater tanks, can be used in homes and businesses for non-drinking purposes such as flushing toilets, watering gardens and washing clothes, helping to save valuable drinking water supplies. The availability of rainwater depends on both the amount of rain and the number of tanks installed and operating at any given time, a number largely dependent on current and future regulatory requirements. In urban areas, uncaptured rainwater flows into rivers and creeks via stormwater drains. In 2018, an estimated 6.5 gigalitres of rainwater was captured in Greater Melbourne by residential buildings (5.3 gigalitres), and commercial and industrial premises (1.2 gigalitres). Rainwater use is generally higher in recently built homes that are fitted with a tank and in properties without potable water access in peri-urban areas.

Even with less rainfall, there is an opportunity to increase the overall volume of rainwater we use through greater uptake of rainwater tanks (see **Section 5.3**).

2.5 Stormwater

Stormwater is rainwater that is not captured in a rainwater tank, which then runs off hard surfaces such as roads and roofs, and flows through drains into waterways, bays and the ocean. Without these hard surfaces, a much smaller proportion of the rainwater would flow directly into local waterways. Instead, it would infiltrate the soil and help recharge groundwater aquifers, potentially reaching local waterways eventually as baseflows.

Each year, only small volumes of stormwater are harvested for use, because our stormwater drainage systems have been designed to reduce the risk of urban flooding: they remove stormwater via drains to the local waterway as quickly as possible. But, if it is treated to the right standard, stormwater can be used for a range of non-drinking purposes. Stormwater harvesting schemes in the region are relatively small and often part of new urban developments, because of the cost and need for available land to capture, store and potentially treat the stormwater for reuse. In 2018–19, it was estimated that only 2 gigalitres of stormwater was reused in Greater Melbourne, out of approximately 400 gigalitres of excess stormwater generated.

In 2018–19, approximately 3 gigalitres of stormwater was licensed for extraction from Melbourne Water's stormwater drainage network, with just under 1 gigalitre of use recorded against these licences. Stormwater harvested from council drains is not included in this total, as this does not require a licence, and less information is available on its use.

As our cities and towns grow, excess stormwater will increase. For example, in Wyndham, one of Australia's fastest growing municipalities, annual stormwater production is expected to grow from 19 gigalitres in 2018 to 35 gigalitres in 2050 (DELWP Werribee Catchment Scale Integrated Water Management Plan). If stormwater can be cost-effectively stored, treated, and distributed to where it is needed, it has significant potential to contribute to water security, local greening and amenity, and recreational opportunities.

Stormwater that is not captured can harm waterway health by carrying litter, pollutants and chemicals into rivers and creeks and disrupting natural waterway flows. However, in highly urbanised catchments with no significant sub-surface flows, stormwater run-off can provide some benefits to the community by maintaining flows in some waterways.

2.6 Recycled water

Recycled water is produced from the wastewater from homes, businesses or industries and has been treated to a suitable quality for its intended use. The closer the user's contact with the water, the higher the treatment needs to be. Treated wastewater and recycled water that is not reused is released to waterways, bays and the sea. Current water infrastructure has been designed to capture and remove wastewater (and stormwater) away from its point of production to treatment plants as quickly possible in order to manage the health risks associated with waterborne diseases. This means that in most cases additional infrastructure is required to get recycled water from treatment plants to where it can be reused.

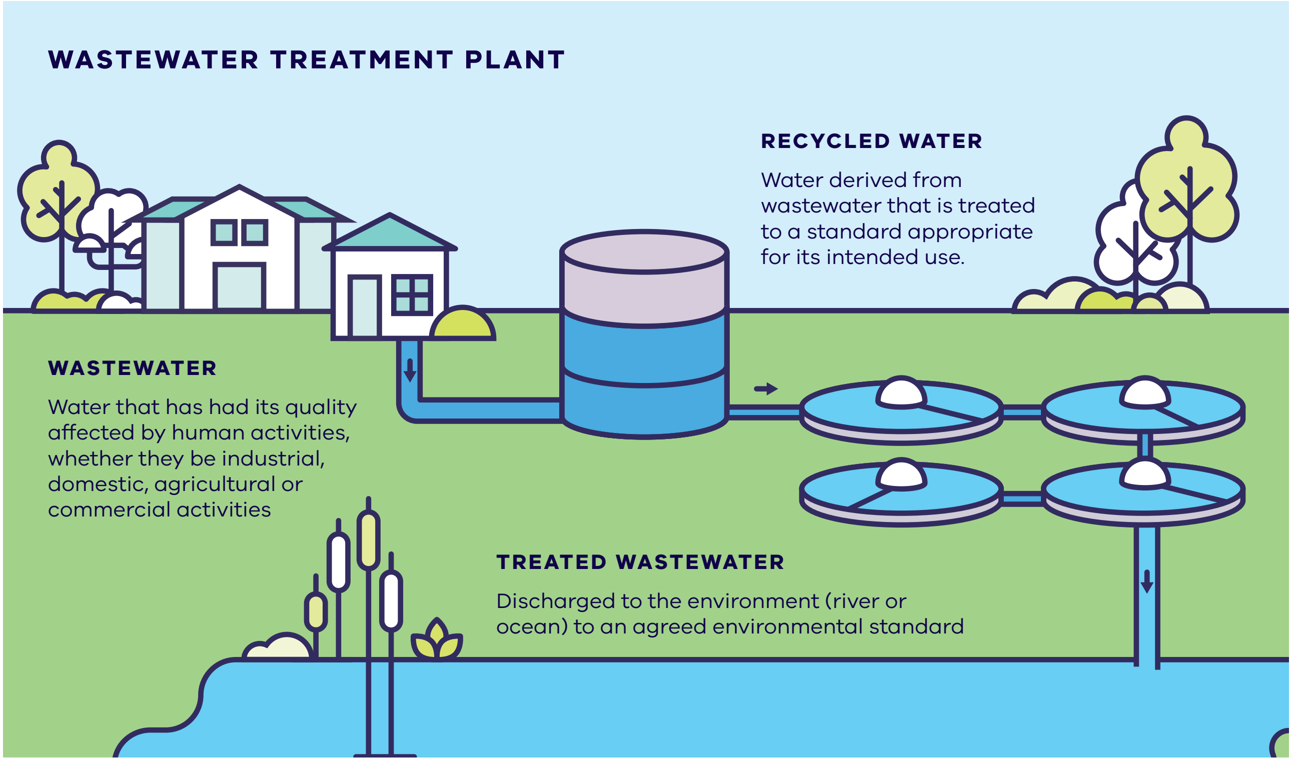


Figure 2.10: Wastewater treatment plant process demonstrating that wastewater is treated prior to being reused (recycled) or discharged to the environment.

In 2019–20, 462 gigalitres of wastewater was produced in the Central and Gippsland Region (DELWP, 2020c). The Eastern Treatment Plant and the Western Treatment Plant handle the largest volumes of the region's wastewater, together processing 344 gigalitres of the total volume. The remaining 118 gigalitres was processed by 74 smaller treatment plants that serve cities and towns across the region.

All wastewater at the Eastern Treatment Plant is treated to Class A recycled water standard, while other treatment plants may treat wastewater to less stringent standards, depending on its intended use. Generally, recycled water can be used for non-drinking purposes, such as:

- agriculture (for irrigation of crops, and stock drinking water)
- irrigation of sporting fields and parks
- residential and commercial purposes (via purple pipe schemes) or industrial processes
- supporting biodiversity (for example, the Ramsar wetlands at the Western Treatment Plant)
- water treatment processes.

Although the volumes of wastewater are large, only a small portion is currently treated for reuse. This is largely because the level of use of recycled water in Victoria has remained constant over the past 10 years, despite increases in wastewater volumes. In 2019–20, only 13 per cent (58 gigalitres) of wastewater volumes was treated and reused as recycled water across the region. The recycled water was used for urban, industrial and agricultural purposes. The remaining 87 per cent (404 gigalitres) of treated wastewater was released to waterways, bays and the ocean under Environment Protection Authority licences (DELWP, 2020c). Factors limiting recycled water use include demand, the cost of storing and delivering it where and when it is needed, and regulatory, economic and policy constraints (see **Chapter 7**).

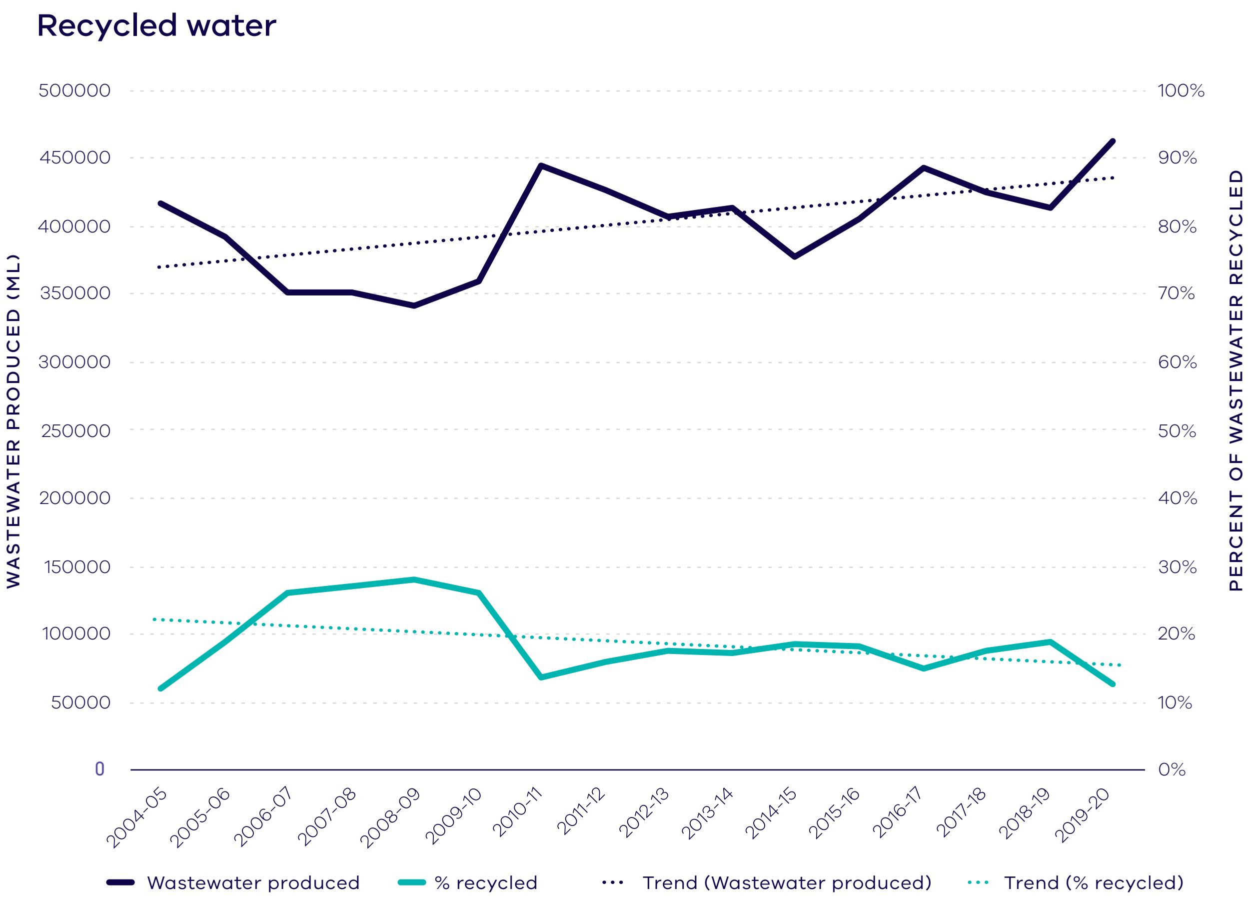


Figure 2.11: Trends in production and use of recycled water in the Central and Gippsland Region

Recycled water supplies are largely independent of rainfall, making them a more reliable source in an uncertain climate. During the Millennium Drought, demand for recycled water grew as severe water restrictions limited the use of drinking water supplies for essential needs. As our cities and towns grow, more wastewater and potentially recycled water will be produced and available for particular purposes. For example, the amount of recycled water produced at Melton (Surbiton Park) Recycled Water Plant will more than triple between 2020 and 2050, due to urban growth in the area (Western Water, 2022).

2.7 Desalinated water

Melbourne and the surrounding region rely on water from the Victorian Desalination Project in Wonthaggi, to give communities and businesses the water they need and thus avoid severe water restrictions. The current average annual deficit between harvestable catchment inflows to the Melbourne system (about 400 gigalitres) and total urban demands (almost 470 gigalitres) is about 70 gigalitres per year. Without the regular contribution of desalinated water, our storage levels would be 20 per cent lower today, and we would be considering the need for water restrictions and urgently planning for the next new source of water.

The Victorian Desalination Project was built during the Millennium Drought to meet the growing water needs of Melbourne and surrounding areas. Desalination works by drawing water from the sea and removing the salt and minerals through a process called reverse osmosis. Although this process is energy intensive, the electricity used to operate the plant is 100 per cent offset with Renewable Energy Certificates.

The Victorian Desalination Project is a reliable, rainfall-independent source of water that can supply up to 150 gigalitres per year — or about one-third of Melbourne's annual use (Melbourne Water, 2021a). The Victorian Desalination Project also underpins water security for Geelong and other regional areas, including South Gippsland, by indirectly or directly providing extra water to cities and towns connected to the water grid.

Regular desalinated water orders from the Victorian Desalination Project are an integral part of the region's water supplies. Each year, the Victorian Government decides how much desalinated water will be ordered, based on advice and data from the metropolitan water corporations, current water storage conditions, projected water demands, climate predictions, and the balance between managing security of supply and keeping water bills affordable. Flexible water orders can be made from 0 to 150 gigalitres (in set increments) to suit variations in climate and demand. **Figure 2.12** shows the water orders that were made from 2016 to 2021, which totalled more than 300 gigalitres (DELWP, 2021a), as well as forecast orders to 2023–24.

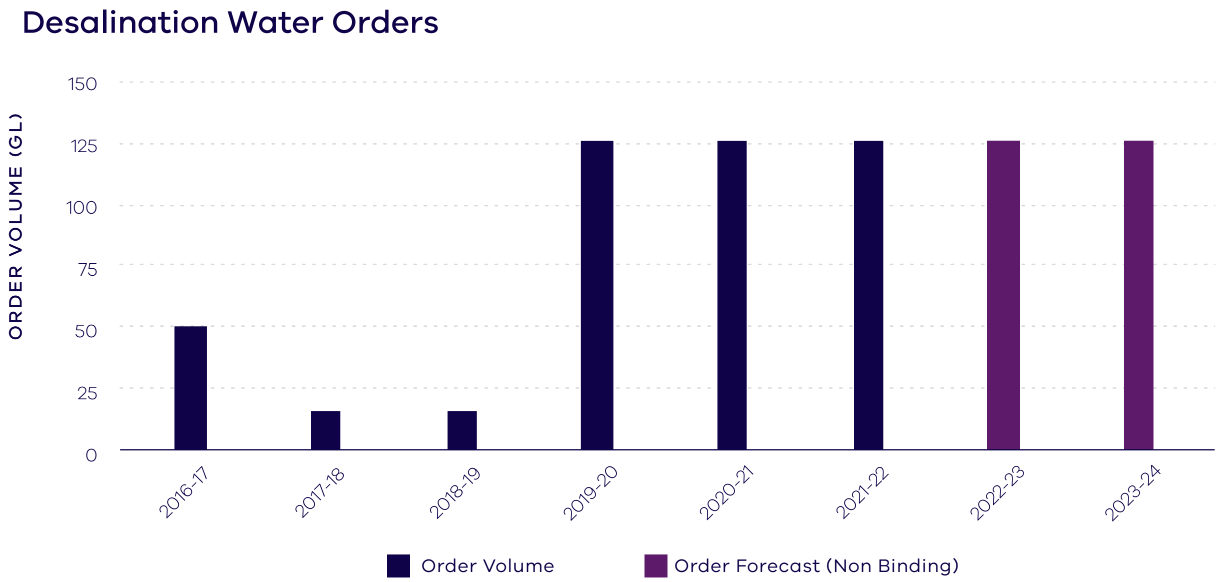


Figure 2.12: Water orders for the Victorian Desalination Project, 2016–24

The Victorian Desalination Project was designed to allow for its capacity to be expanded to 200 gigalitres per year. Some components of the Victorian Desalination Project (including its inlet and outlet tunnels, the transfer pipeline and the power supply) are already sized to handle increased capacity, while other components, such as the treatment facility, would need to be expanded.

3. Water users and values — now and in the future

Image: River on the Maribyrnong River, Wurundjeri Woi-wurrung Country

At a glance

- Thriving communities rely on safe, reliable and affordable water supplies for households, farmers, business and industries. Water is also needed for the environment to support healthy waterways, for Traditional Owners to support cultural and other self-determined uses of water, for recreational uses of waterways, and to preserve future water supplies.
- Victorian Traditional Owners have cultural, spiritual and economic connections to land, water and resources through their relationships with Country. Historical exclusion of Traditional Owners from water planning, management and ownership has created social and economic inequities that need to be remedied.
- The region's drying and variable climate presents challenges and opportunities for more than 6 million Victorians who rely on the region for water. Without a planned approach to sustainable water management, Melbourne and Geelong could face water supply shortages this decade.
- The Central and Gippsland Region supports $4.7 billion of diverse dryland and irrigated agricultural production. Climate change, years of drought, and bushfires have all adversely affected the region's agricultural water supplies.
- The volumes of water flowing in our rivers is declining, affecting the health of the region's rivers, wetlands, floodplains, estuaries and water catchments. Climate change will continue to affect streamflow and the environmental condition of already stressed waterways. Significant volumes of additional water are needed to prevent the further deterioration of these waterways and to support and improve their environmental values.
- Waterways in the region are highly valued by Victorians for the wide range of recreational activities they offer and their contribution to the health, wellbeing and social fabric of communities. They also support tourism and provide important economic benefits to regional Victoria.

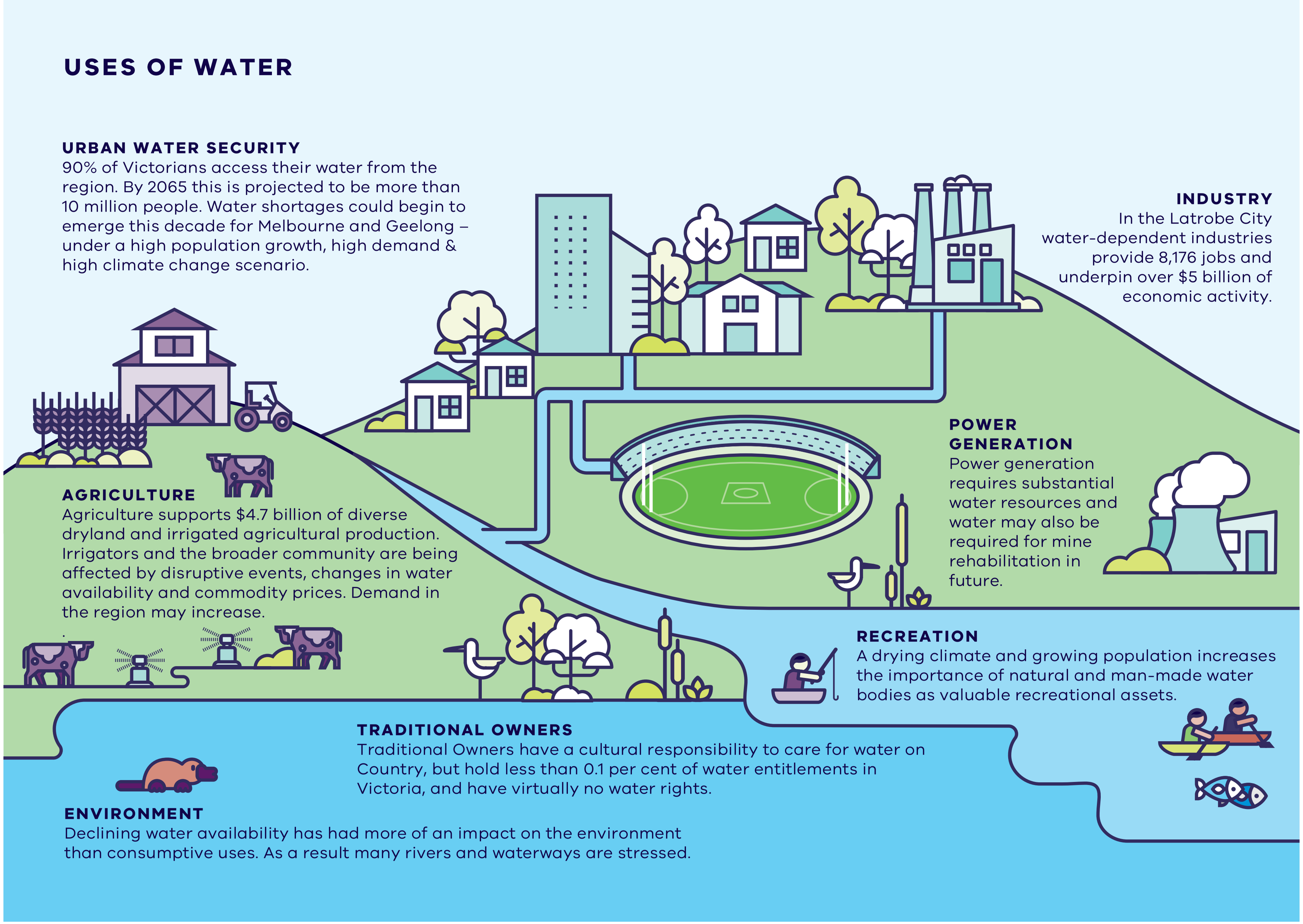


Figure 3.1: Various uses and values of water across the Central and Gippsland Region

3.1 Mix of water uses and values

In the Central and Gippsland Region, water corporations, which supply households, businesses and industries in our cities and towns, hold the largest share of water entitlements (842 gigalitres or 52 per cent),[3] while agriculture accounts for about one-third of water entitlements (576 gigalitres or 35 per cent). Only 2 gigalitres (or 0.1 per cent) has been allocated to Traditional Owners to date.

The Victorian Environmental Water Holder holds about 70 gigalitres or 4 per cent of water entitlements for the environment, although the environment also benefits from 'above-cap' water. This is water that is left over after limits on diversions have been reached, and includes water that spills from storages after high rainfall and inflows. Above-cap water is the biggest contributor to the long-term availability of water for the environment, and the most at risk from climate change (DELWP, 2020b).

The water entitlement framework is described in **Appendix F**.

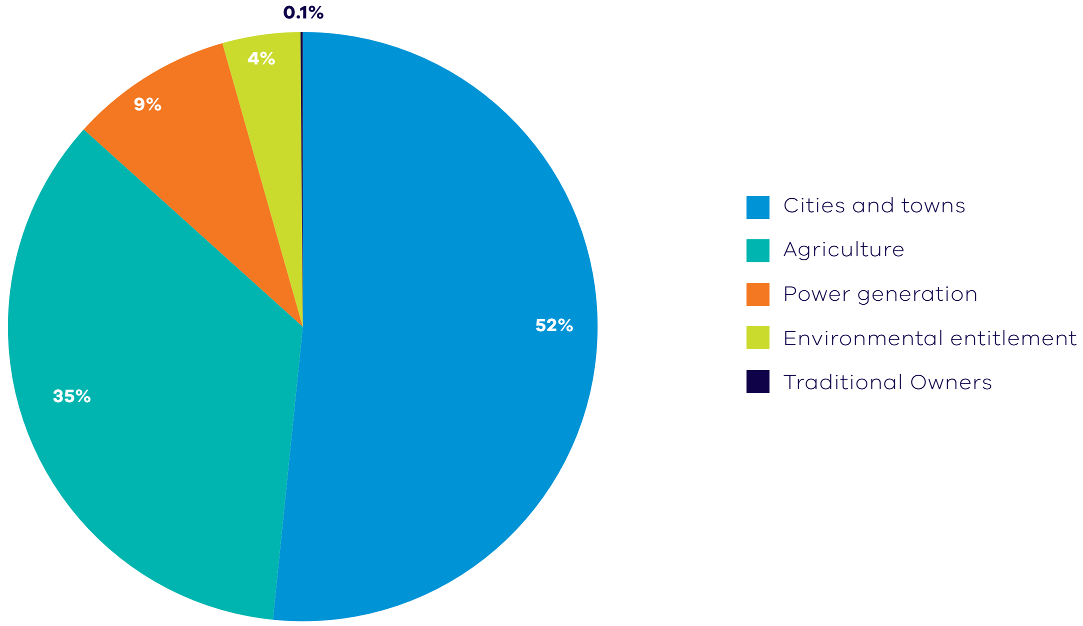


Figure 3.2: Approximate distribution of surface water and groundwater entitlements across different uses in the Central and Gippsland Region. Surface water makes up 85 per cent of entitlements, while groundwater is 15 per cent

Sharing of water between these different uses varies across the region. **Figure 3.3** and **Appendix E** show the volume of river water across the basins that is allocated for various consumptive uses. Water allocated for urban, industrial and farming uses is high in developed systems such as the Yarra, Thomson and Latrobe (426 gigalitres per year). In East Gippsland, the volume allocated for consumptive use is less than 2 per cent of available surface water in the Mitchell, Victorian Snowy and Tambo basins. While groundwater makes up only 15 per cent of water entitlements across the region, it is an important resource in specific places, including in the Jan Juc, Rosedale, Sale and Stratford Groundwater Management Areas.

The Victorian Water Accounts provide more information about how water sources are shared and used across Victoria (DELWP, 2020c).

3 The amounts cited for cities and towns include household, commercial and industrial use. Across Greater Melbourne, about two-thirds of potable water supplied is to households, with the remainder for commerce and industry, and to operate the water supply system (Melbourne Water, 2017).

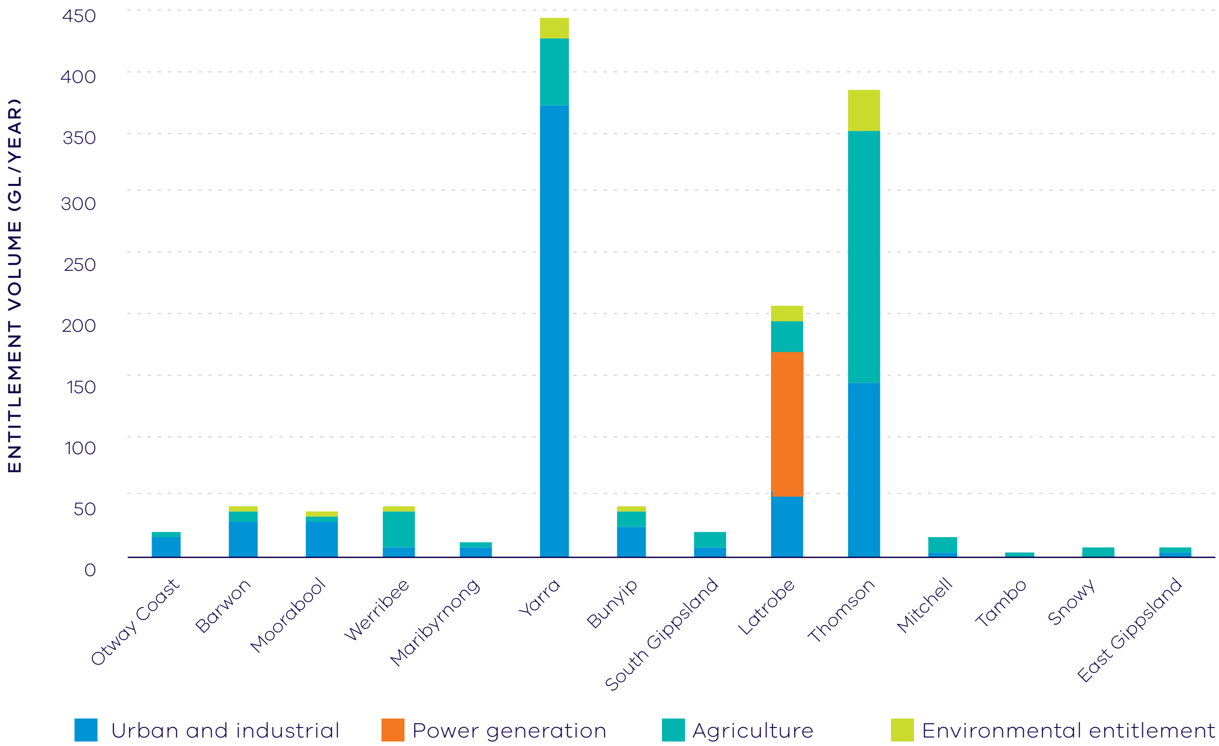


Figure 3.3: River water allocated for consumptive uses and sharing arrangements in the Central and Gippsland Region basins

Image: Mitchell River, Bairnsdale, Gunaikurnai Country

3.2 Urban use

Although it makes up just 25 per cent of Victoria's land area, the Central and Gippsland Region supplies water to more than 90 per cent of the state's population (more than 6.2 million Victorians). The cities and towns south of the Great Dividing Range, from Warrnambool in the west to Mallacoota in the east,[4] rely on water from this region. In 2018–19, more than 523 gigalitres of water was supplied to businesses and industries, as well as to urban residential customers (DELWP, 2020c).

Significant population growth and the effects of climate change are increasing the demand for water. The number of people relying on water in the region is expected to increase to more than 10 million by 2056 (**Figure 3.4**). Over the same period, the volume of available river water, the source of most urban water, could decrease by between 8 and 22 per cent under a medium climate change scenario (see **Section 2.2**). Now is the time to plan how we will meet future demand and avoid severe restrictions and shortfalls.

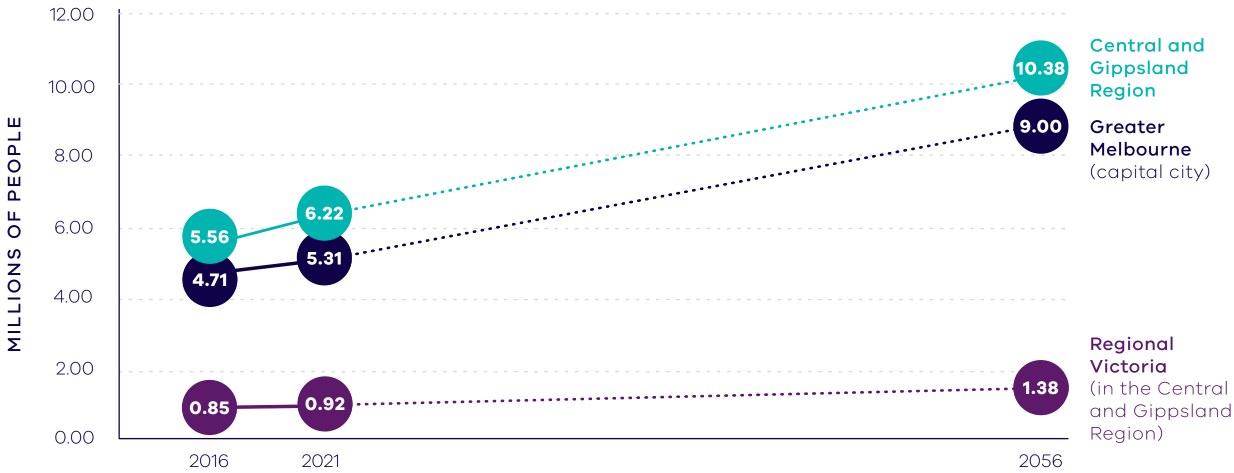


Figure 3.4: Past and projected populations of major Victorian regions, 2016 to 2056 (based on DELWP, 2019a)

Because rainfall varies naturally from year to year and from season to season, water corporations in the past built dams to store water, when it was available, for use when it was needed. Water corporations typically plan to have several years' worth of urban water supply in storage to minimise the risk of water shortages during drought periods. A good indicator that new supply sources may be required in the near term is an annual supply shortfall (when the annual average demand is equal to or greater than the annual average supply from a water supply system). When this is forecast to occur in the near term, water corporations undertake sophisticated modelling to assess when new supply sources will be needed; they consider factors such as future water availability, the potential magnitude and duration of future droughts, ability to store water in the system and how often water restrictions would be acceptable to customers.

A supply shortfall does not necessarily mean there will not be enough water every year from that point, because the shortfall is usually met in the short term by using water currently in storage. Even where there is insufficient water in storage, other measures are possible, such as applying water restrictions to reduce demand, purchasing water from another system or drawing on supplementary supplies (such as groundwater) until additional supply can be added to the system.

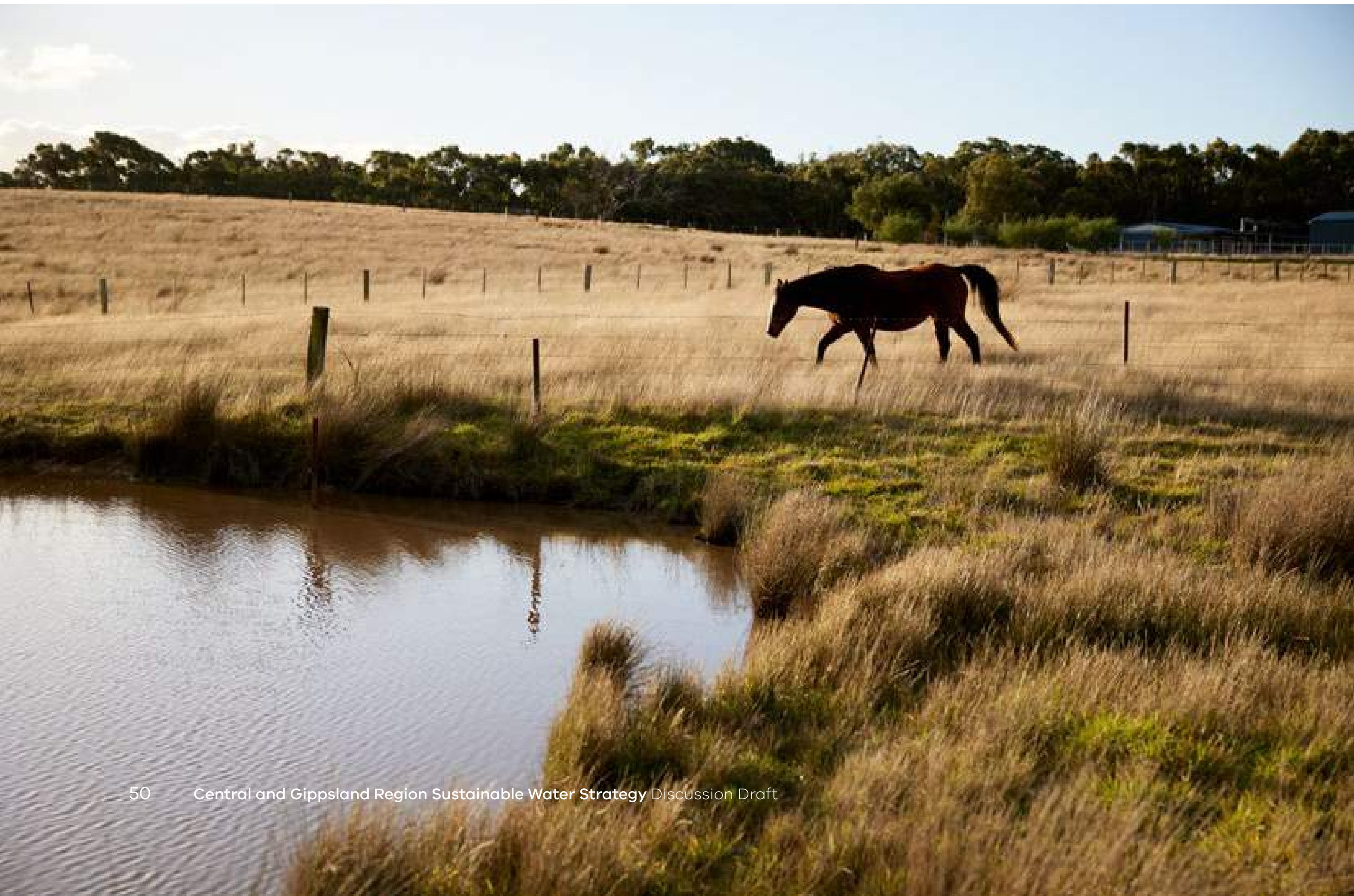
Parts of Gippsland, such as the growing towns of Warragul and Drouin, are already experiencing supply shortfalls and are relying on interim water purchases to supplement local supplies. Modelling by Melbourne Water and Barwon Water has shown that, without a planned approach to sustainable water management, Melbourne and Geelong could face water supply shortfalls this decade. The combined effects of a high climate change scenario and high population growth for Melbourne could see a water supply shortfall of 450 gigalitres for Greater Melbourne by 2065 (Melbourne Water, 2017).

4 Wannon Water extracts water from the Gellibrand River in the Otway Ranges to supply its customers in Warrnambool.

Water corporations manage the supply of water to the region's urban areas (**Figure 3.5**). This management role includes developing long-term plans — Urban Water Strategies — that recommend actions to ensure that water supplies are safe, reliable and affordable in each water corporation's service area. Urban water corporations are currently modelling different supply scenarios, which test different climate change scenarios and demand projections, to inform their Urban Water Strategies. These Strategies are developed every five years, and reflect the best available data and modelling, as well as feedback from water users and the community. They also plan for the impact on water supplies from extreme events such as bushfires, floods and droughts through the development of Drought Preparedness Plans. These plans both prepare for and respond to water shortages from extreme events in the immediate- and short term (DELWP, 2021b).

This Strategy will be aligned with the Urban Water Strategies, which are being developed in parallel across the region (**Figure 3.6**). Drafts of these for the Central and Gippsland Region, including their updated forecasts of water supply shortfalls and timeframes, are expected to be made public in late 2021. The Urban Water Strategies will identify fit-for-purpose demand management and supply options to meet the needs of each water corporation's customers. They will inform this Strategy by identifying likely future demands and the options to meet those needs. Supply options that extend beyond individual water corporation boundaries or that have potential to make a significant contribution towards meeting the objectives of this Strategy will inform the final Strategy. The final document will set the priorities for the region by determining how these relevant options at the water corporation scale will best provide for the future water needs and values of all users across the region.

Image: Horse Trotting beside a dam, Elaine rural property, Wadawurrung Country



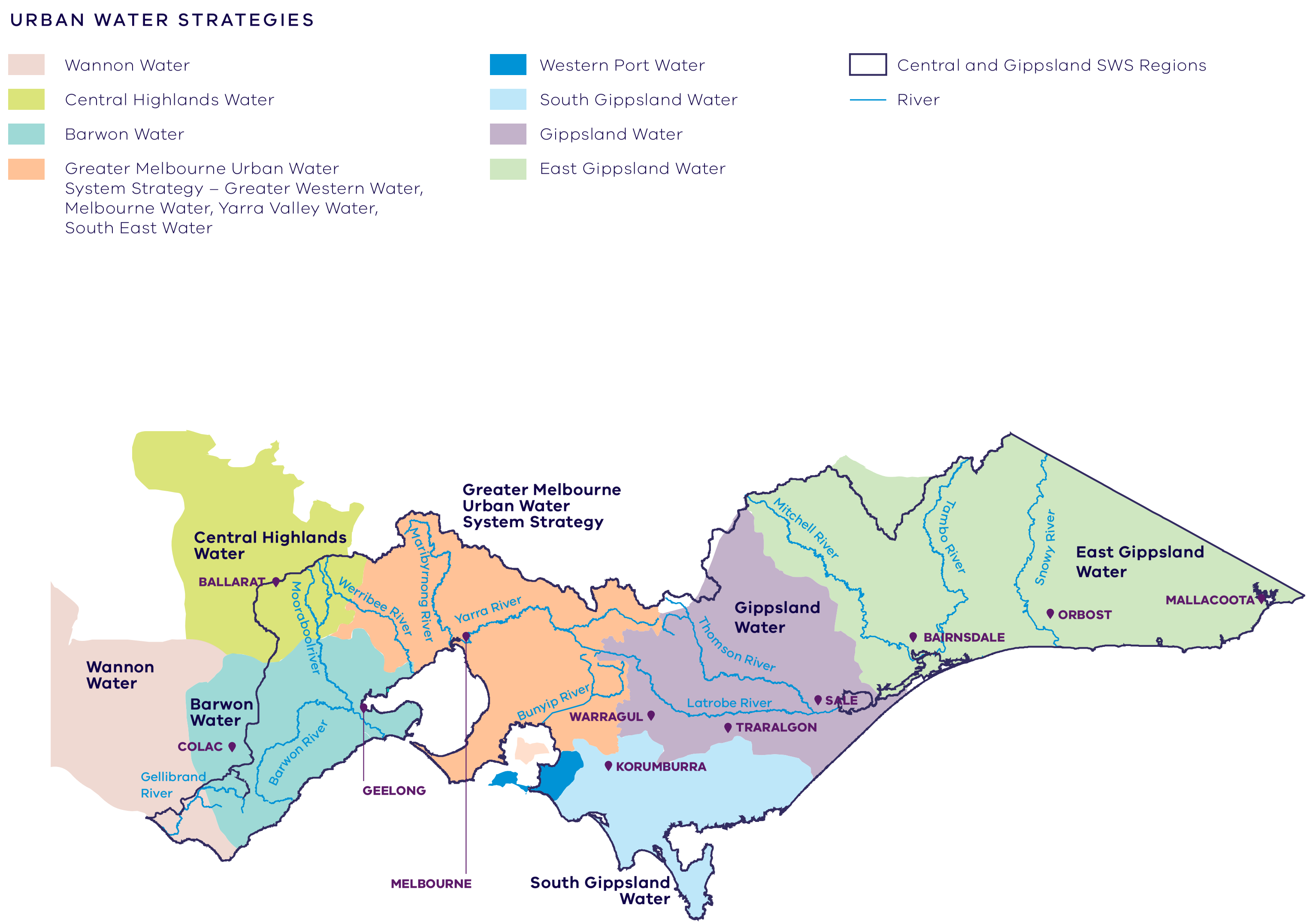


Figure 3.5: Urban Water Strategies in the Central and Gippsland Region

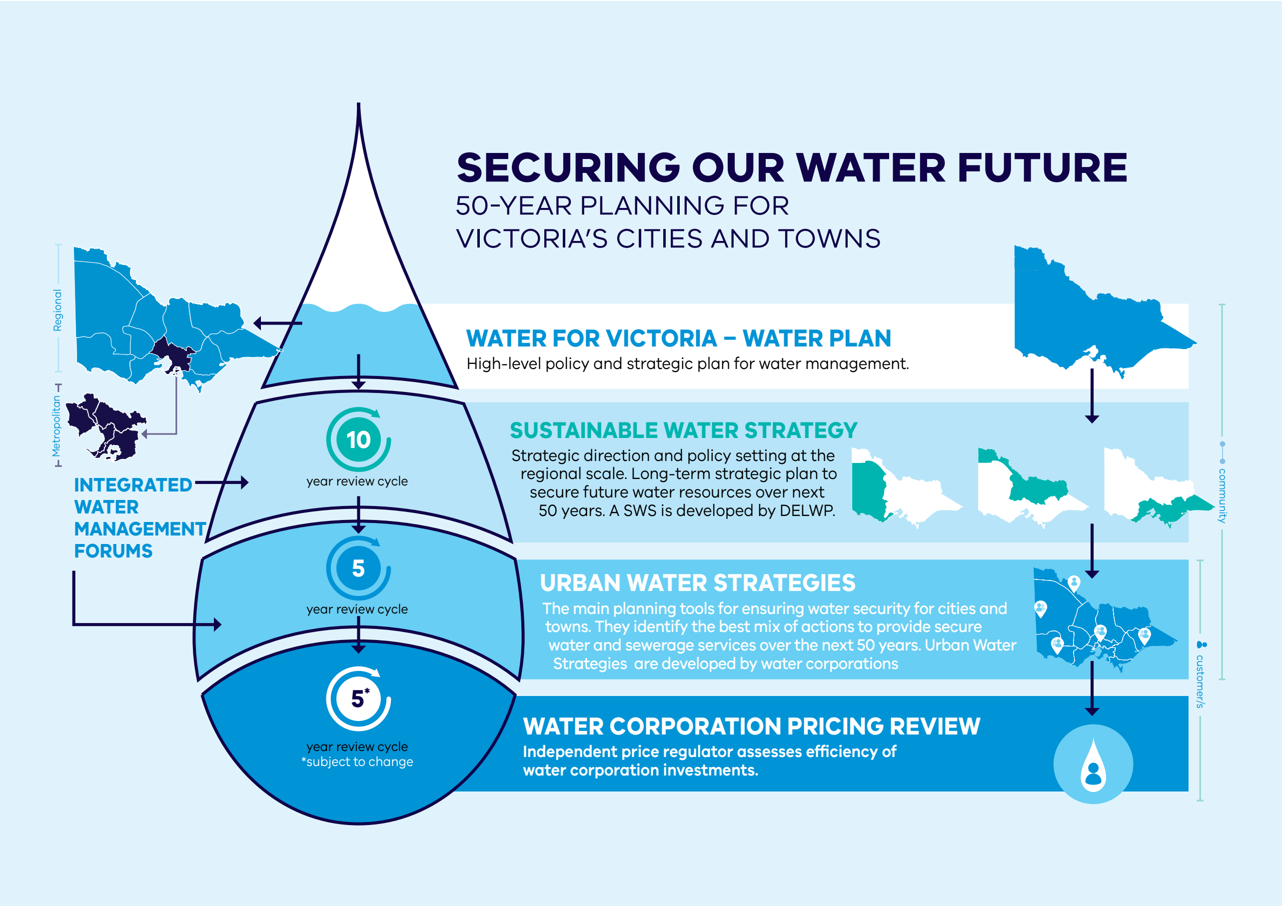


Figure 3.6: Links between Sustainable Water Strategies and Urban Water Strategies

Image: Agriculture fields, Werribee Irrigation District, Bunurong Country

3.3 Agricultural use

The Central and Gippsland Region of Victoria supports $4.7 billion of diverse dryland and irrigated agricultural production, including 30.6 per cent of Victoria's dairy products, 28.1 per cent of Victoria's beef and more than 25 per cent of the state's vegetables (ABS, 2020).[5] Farm production supports major food-processing enterprises in the Melbourne region and is an important component of regional economies.

Agricultural production accounts for 26 per cent of surface water entitlements in the region.

Water is used for agriculture right across the region, but is concentrated in the Macalister, Werribee and Bacchus Marsh irrigation districts, managed by Southern Rural Water. In 2019–20, irrigators in the Macalister Irrigation District used 160 gigalitres of water from the Macalister and Thomson rivers, while those in the Bacchus Marsh and Werribee irrigation districts used 12 gigalitres of surface water, predominantly supplied from the Werribee River. Irrigators in the Werribee Irrigation District also use recycled water from the Western Treatment Plant in Werribee to supplement their surface water entitlements — in 2019–20 they used 14 gigalitres of recycled water (DELWP, 2020c).

In 2020–21, approximately 7.5 gigalitres of recycled water was used for agriculture to the south-east of Melbourne, supplied from the Eastern Treatment Plant, the south-eastern outfall and smaller local treatment plants. Agricultural use in this part of the region includes the Eastern Irrigation Scheme.

Outside major irrigation districts, farmers divert water directly from waterways or groundwater aquifers, which they can use immediately, or store in private dams for future use. Both the diversion of water and storage in a dam require a licence. Groundwater used for agriculture across the region was 59 gigalitres in 2019–20, with most use in the Central Gippsland groundwater catchment. The volumes of water used from waterways or private commercial and irrigation dams across the region in 2019–20 were 34 gigalitres and 37 gigalitres respectively (DELWP, 2020c).

Relatively reliable rainfall and proximity to markets and food processors mean the region is well placed to expand and diversify its agricultural production. However, climate change, years of drought, and bushfires are already putting pressure on water supplies.

3.4 Water for the environment

Decades of extracting water and changes to land use have resulted in less water in rivers and wetlands, and significant disruptions to natural flows. Adequate water for the environment is critical to waterway health: it supports fish, platypus and other native animals and plants that rely on healthy waterways. When waterway health declines, it can cause problems such as algal blooms and fish deaths, and these may affect other water users, including agriculture, industries, Traditional Owners, recreation and tourism. **Figure 3.7** shows the links between different components of flow in rivers and the environmental benefits and processes that those flows support. This categorisation is used as the basis for identifying environmental watering requirements and prioritising environmental watering events to achieve specific benefits for species or ecological function in rivers across the region. All aspects of river flow regimes, including overbank flows and periods of low flows, are vital to help preserve and protect Traditional Owner cultural values.

5 Gross value of agricultural production (GVAP) 2017–18. This includes all of the Corangamite Natural Resource Management region (ABS:2020).

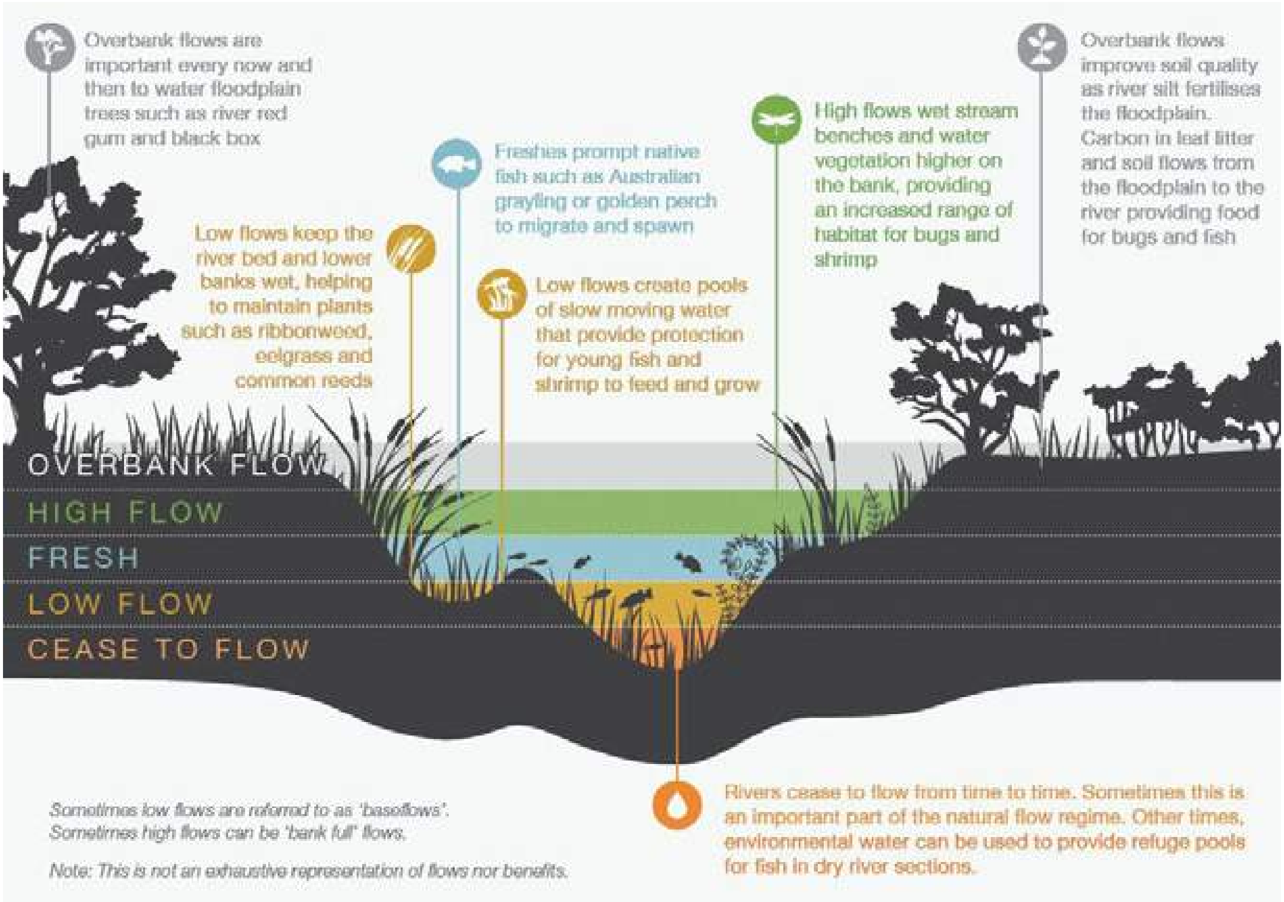


Figure 3.7: How components of the flow regime benefit aquatic ecosystems (source: VEWH, n.d., p. 3)

Since average water availability was last calculated for the previous Sustainable Water Strategies, water for the environment has declined by 4 to 28 per cent. The Long-Term Water Resource Assessment for Southern Victoria (DELWP, 2020b) found that long-term average water availability has declined across the region and that the environment has borne a disproportionate impact of that decline in seven basins in the region: Barwon, Moorabool, Werribee, Maribyrnong, Yarra, Latrobe and Thomson. In these basins, the environment now has a smaller share of the available water than when it was assessed for the last Sustainable Water Strategy. This is because above-cap water is by far the biggest contributor to the long-term average availability of water for the environment, and it is the first water to be lost when inflows decline (DELWP, 2020b). Modelling shows that an additional 97 gigalitres per year would be required across the region to restore the environment's share to what it was in 2005–10 (**Table 3.1**).

Climate change will continue to deplete streamflow and the environmental condition of already stressed waterways. Significant volumes of additional water are needed to prevent further deterioration of these waterways and protect their environmental values and other benefits for the future.

It is estimated that a total of 263 gigalitres of water per year would be needed to maintain and improve current environmental values and improve the current condition of waterways across the region over the long term (**Table 3.1**). But we cannot meet this total deficit in the near term without jeopardising water security for households, industry, businesses and farms — it is simply too large. For example, in the Barwon River, the modelled environmental water deficit volume is 44 gigalitres, while the total volume of water diverted from rivers in the Barwon Basin in 2019–20 was 42 gigalitres (DELWP, 2021a). This Strategy proposes environmental water recovery targets for each major river system that prioritise the minimum volumes needed for critical flows and to ensure the survival of important species in the next 5 to 10 years (see **Chapters 10, 11** and **12** for Gippsland, Central and Barwon/Moorabool respectively).

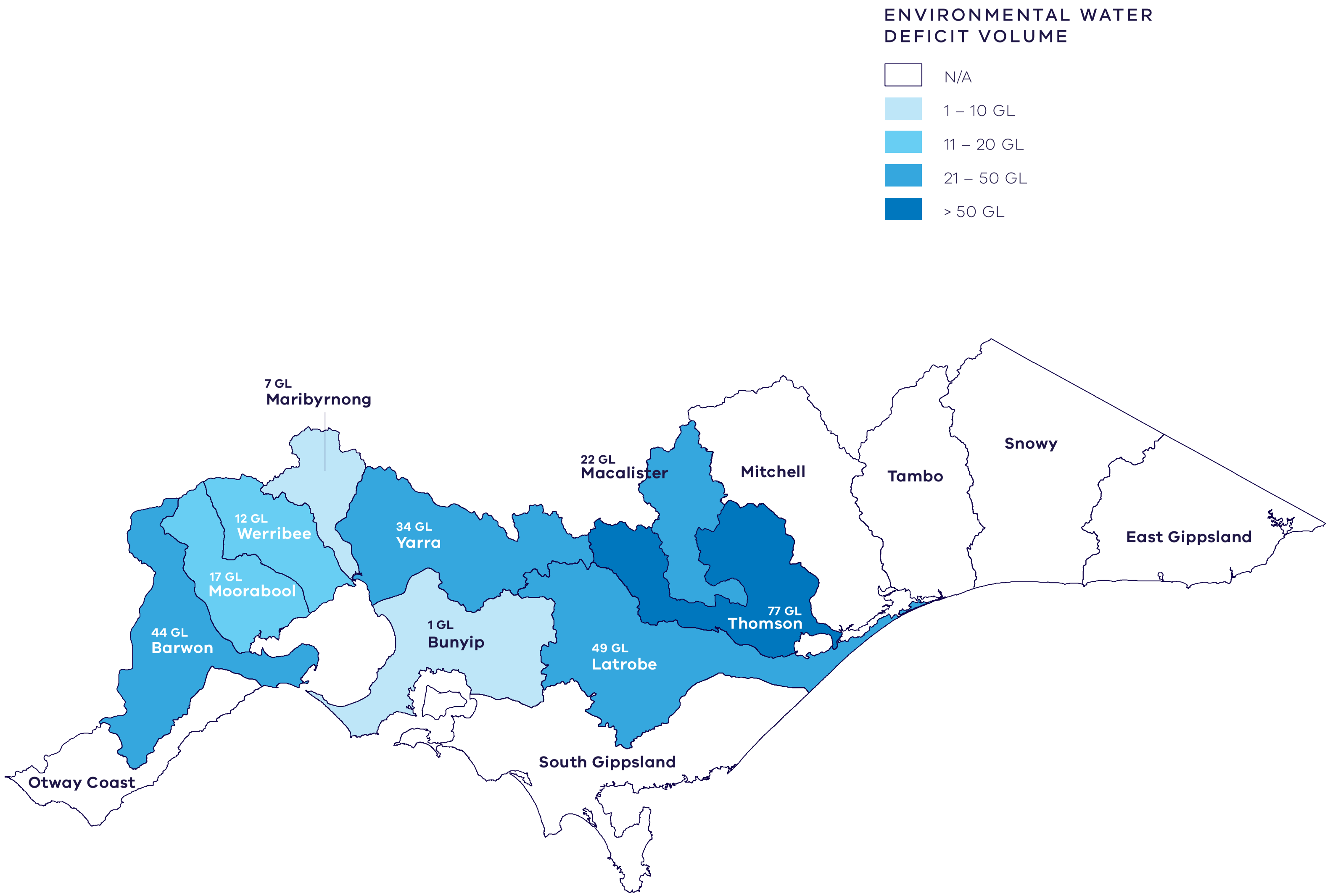


Figure 3.8: Total environmental water deficits for the Central and Gippsland Region (based on post-1975 baseline)

Table 3.1: Water needed to meet rebalancing requirements for the environment as determined by the Long-Term Water Resource Assessment and environmental water deficits (gigalitres per year) in each Central and Gippsland Region basin

Basin	Volume for rebalancing[6]	Environmental water deficit
East Gippsland	–	–
Snowy	–	–
Tambo	–	––
Mitchell	–	–
Thomson	7	77
Macalister		22
Latrobe[7] (Tyers)	23	49[8] (32)
South Gippsland	–	–
Bunyip and Tarago	–	1
Yarra	53	34
Maribyrnong	1	7
Werribee[7]	5	12
Barwon/Leigh[7]	4	44
Moorabool	4	17
Otways	–	–

6 In most basins, the rebalancing volume sits below or within the range of the environmental water deficits and water recovery targets as discussed in **Chapters 10**, **11** and **12**. If the environmental water recovery targets are met, the volume for rebalancing will also be achieved (that is, they are not additive). For further information, see **Appendix C**.

7 Flow recommendations for the estuaries or lower Latrobe wetlands are not included.

8 This is the flow recommendation for priority reach 4 in the Latrobe.

Water recovery targets

Allocation of water in a waterway attempts to balance the needs of all users, including those of the environment. Prioritised water recovery targets are proposed for each major regulated river in the region, which focus on minimum volumes to meet critical flows and to ensure the survival of important species in the next 5 to 10 years. These figures are smaller than the full environmental water deficits, and are aimed at recovering volumes of water to meet specific critical needs (for example, 2.3 gigalitres in the next five years to provide minimum critical flows for water quality and important species in the Barwon River), while acknowledging the competing demands for our local waterways. (See **Chapters 10, 11** and **12** for Gippsland, Central, and Barwon/Moorabool respectively.)

All targets assume that existing environmental entitlements will remain, and exclude overbank flooding flows to avoid any impacts such as flooding of private land and effects on third parties.

As a priority, the proposed environmental water recovery targets aim to:

- prevent cease-to-flow events, maintain water quality, and provide drought refuges
- ensure the sustainability of high-value aquatic fauna and flora
- ensure resilience of environmental values under a drying climate, thereby providing for all values dependent on healthy waterways.

Water recovery targets have yet to be established in some systems, including estuaries, connected wetlands and some flow-stressed rivers such as the Avon and Tarwin. In time, targets for these systems, and any other priority systems, will be developed using the same method as described above.

Shared benefits for Traditional Owners from water for the environment

Delivering water for the environment benefits plants and animals but can also help achieve cultural outcomes. For Traditional Owners, all water on Country is integral to life itself, and interconnected with the broader cultural landscape. Keeping as much water as possible in waterways is vital in achieving Healthy Country, Healthy Mob, and for self-determination. Traditional Owners have managed land and water sustainably over thousands of generations. Declining surface water availability impacts on the ability of Traditional Owners to maintain their ongoing responsibility to care for Country for future generations. By improving the health of rivers, wetlands and floodplains, water for the environment intrinsically helps everyone.

Water for the environment can help Traditional Owners to realise outcomes for cultural values where there are also benefits for the environment. Traditional Owners can incorporate Traditional Owner knowledge and ways of managing connected landscapes, to benefit both the environment and culture.

This knowledge contributes to holistic water management and supports robust decision-making and may help environmental water managers set priorities where there are competing ecological values, as well as giving Traditional Owners more of a say on managing water on Country.

Identifying cultural values can be crucial to achieving shared benefits with Traditional Owners from water for the environment. Traditional Owners have a choice of ways to do this, including Cultural Value Studies, Aboriginal Waterway Assessments, and other methods.

Complementary measures

Complementary measures do not involve water recovery but can improve the overall health of the waterway. For example, installing a fishway or improving water quality does not increase the volume of water available to the environment, but can considerably improve waterway health. In some cases, the use of complementary measures can decrease the volume of water required to be recovered, or bring benefits that would otherwise not be feasible — for example, using pumps to move water into a wetland rather than relying on high, overbank flows to move the water naturally.

Water availability in unregulated river systems

In priority unregulated systems that are flow-stressed in summer, formal arrangements can be adopted to sustainably manage available water to balance the needs of all users, including those of the environment. There are seven Streamflow Management Plans across the region that do this.

For the remainder of the unregulated systems, the Environmental Water Reserve is mainly protected by policies and rules relating to trade and use of licences to extract water. The allocation of additional licences must ensure that environmental values are not significantly affected (see **Section 8.4**).

Image: Coal mine pit behind rural properties, Gunaikurnai Country

3.5 Power generation and mine rehabilitation

The three brown coal mines in the Latrobe Valley have powered Victoria's economy, fuelling most of the state's electricity generation since 1924. However, the closure of the Hazelwood Mine and Power Station in 2017, and the projected closure of power stations at Yallourn and Loy Yang in 2028 and 2048 respectively, herald a fundamental shift in the region as more renewable energy sources come online and demand for electricity from brown coal reduces. As coal mining in the Latrobe Valley comes to an end, the focus shifts towards mine rehabilitation and the opportunities that this opens up for regional development.

Because newer sources of energy will not require the same volumes of high-security water as coal-fired electricity generation, the electricity industry's transition in the Latrobe Valley signals the potential for a water transition in the region too. A water transition could go some way to counter the decline in water availability to existing uses and values. It could also provide cultural, social, economic and environmental benefits and support the region through its transition by underpinning job creation, agriculture, and economic activity and building the region's resilience to climate change and variability.

The Latrobe Valley mine operators are considering water-based rehabilitation options to transform the mines into safe, stable and sustainable landforms. Depending on the mine rehabilitation plan proposed, up to 2,800 gigalitres of water (in total, not annually) could be requested to completely fill all mine voids to their crest, if a water-based approach to rehabilitation is the final approved rehabilitation solution for all mines and if less water-intensive mine rehabilitation options are not acceptable for the region (DJPR, 2020). Because rehabilitation will be undertaken progressively as each mine closes, this means that the volume of water, if required at all, will vary over time and for each location. It is likely that if any water-based mine rehabilitation were to be selected, rehabilitation would take many decades and may require a range of water sources – including surface water, groundwater and manufactured water sources to meet the requirements of the mine rehabilitation plan.

Guiding the rehabilitation of the mines is the Victorian Government's Latrobe Valley Regional Rehabilitation Strategy, which does not commit to a preferred approach to rehabilitation. The strategy indicates that any decision on using water from the Latrobe River system for mine rehabilitation will need to take into account availability of different water sources and a drying climate, and fully protect the rights of existing water users (farmers, towns, industries and the environment) and the Gunaikurnai Traditional Owner values.

Options for rehabilitation that do not rely on water from the Latrobe River system are also being considered. For example, the Victorian Government is exploring manufactured water options for mine rehabilitation, such as recycled water, and identifying non-water-based or less water-intensive options to manage land instability and fire risks.

If water from the Latrobe River system or Latrobe Valley aquifers is used for mine rehabilitation, mine licensees would apply to the Minister for Water for water entitlements for this purpose (if needed) up to five years before ceasing mining operations at the site. To protect the security of existing water users' entitlements and minimise the impact on the values of the Latrobe River and Gippsland Lakes system, the maximum annual supply of surface water for mine rehabilitation would need to be no more than the three power stations' historic annual net usage,[9] and might need to be limited to a smaller volume in response to declining water availability over time

9 Since 2005–06, the Latrobe Valley power stations have used, on average, around 78 gigalitres per year of surface water from the Latrobe River system for power generation, and mine operations have extracted around 28 gigalitres per year of groundwater to maintain the stability of coal mine voids during mining activities. Around 23 gigalitres of water per year has been returned to the Latrobe River system, which has been used by irrigators and provided benefits to the environment. As a result, the net surface water usage for power generation has been around 55 gigalitres per year.

Hydrogen production

Renewable hydrogen is a zero greenhouse gas emission and multipurpose energy carrier that could play an important role in the decarbonisation of Victoria. Potential uses include blending with or replacing natural gas in our pipelines, long-term electricity storage, or powering zero-emissions vehicles, including trains, buses and cars.

Although hydrogen production's water requirements are relatively small, the use of climate-resilient water, such as recycled water from wastewater treatment plants, is an important step towards a circular economy. A further incentive for the co-location of hydrogen production facilities and wastewater treatment plants is high-purity oxygen, a by-product of hydrogen production. Low-cost and sustainable, pure oxygen is a useful input to wastewater treatment plants and has the potential to significantly reduce the carbon emissions of Victorian water corporations.

In May 2021, the Australian Renewable Energy Agency announced funding of $32.1 million towards the development of a hydrogen production facility in Wodonga, which will be co-located with North East Water's wastewater treatment plant.

Image: Domestic and Stock dam, Elaine rural property, Wadawurrung Country

3.6 Domestic and stock water

People can take water from a range of sources for domestic and stock purposes, including extracting water from a waterway that runs alongside or in their property, capturing water in a small catchment dam or pumping groundwater.

More than 5,000 farm businesses are involved in dryland agriculture in the Central and Gippsland Region and rely on water provided by natural rainfall and via domestic and stock rights.

Dryland farming enterprises without reliable access to water are particularly vulnerable to seasonal variability and the effects of increased frequency and longer duration of dry periods, which are projected for the region due to climate change. Domestic and stock water supplies can also be affected by bushfires and other extreme events.

Maintaining access to domestic and stock water supplies

Domestic and stock water supplies in the Gippsland region have in the past been supported by reliable rainfall. But long periods of below-average rainfall — particularly the most recent drought in Gippsland — have put domestic and stock water supplies under pressure, highlighting the need to plan for access to water during future dry conditions.

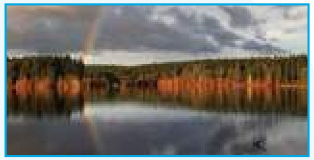
Emergency water supply points (EWSPs) are distributed through the region to supplement existing domestic and stock water supply during dry conditions and extreme events such as bushfires and floods.

Development of large-scale domestic and stock water supply systems are currently not feasible in Gippsland due to distance, landscapes and the high costs of construction and operations. As water availability and climate conditions change in the future, decisions about public investment in any domestic and stock water supply projects will be guided by Victoria's principles for public investment in rural water infrastructure (see **Chapter 9**).

The Victorian Government continues to work with local councils, water corporations and the community to regularly review the EWSP network, undertaking maintenance and augmentation as required. We will make sure that before we invest in refurbishment of existing, or construction of new, EWSPs, there is an agreement in place for a responsible agency to maintain, operate and provide access to EWSPs.

3.7 Social and recreational uses and values

Waterways and water bodies in the Central and Gippsland Region are highly valued by Victorians for the wide range of recreational activities they offer and their contribution to the health, wellbeing and social fabric of communities. They support tourism and provide important economic benefits to regional Victoria.



Credit: Central Highlands Water

Recreation at reservoirs

The reservoir parks of Kirks, Gong Gong and Moorabool Reservoirs, near Ballarat, offer picnic areas, barbecues, walking tracks and bike trails for visitor enjoyment. For more information visit **https://www.chw.net.au/community/reservoirs,-parks-and-gardens/**

West Barwon Reservoir, located in the Great Otway National Park provides picturesque views and designated mountain bike trails. For more information visit: **https://www.barwonwater.vic.gov.au/community-and-education/recreational-areas**

For those interested in activities on the water, swimming, kayaking, boating, and fishing are available at Pykes Creek Reservoir, Lake Glenmaggie, Lake Narracan and Blue Rock Lake. For more information visit: **http://www.srw.com.au/**

Credit: DELWP (Tim Bell)

Yarra River

The Yarra River, Birrarung, flows 242 km from its source in the Yarra Ranges all the way to Port Phillip Bay. It's a major contributor to Melbourne's liveability, and offers fantastic opportunities for walking, cycling, paddle sports and relaxation. For a scenic riverside cycle or walk explore the Main Yarra Trail running from Templestowe to Southbank in Melbourne's CBD. For more information visit: **https://www.melbournewater.com.au/water-data-and-education/water-facts-and-history/know-your-rivers-and-creeks/yarra-river**

Credit: Destination Gippsland

Snowy River:

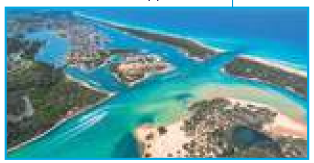
The Snowy River begins in Kosciuszko National Park in NSW and winds 352 km south until it reaches the sea at Marlo, East Gippsland. The majestic Snowy River National Park features lush forests and stunning river scenery including waterfalls and gorges. It's a popular spot for canoeing, rafting, bush walking and camping. The river downstream from Orbost and the Snowy River estuary at Marlo are also great places for walking, boating, fishing and camping. For more information visit: **https://www.visiteastgippsland.com.au/**

Credit: Corangamite CMA

Barwon River:

The Barwon River is one of Geelong's greatest natural assets, and the river is a hub for community sport and recreation, including rowing, water-skiing, canoeing and fishing. The network of trails attracts many cyclists, walkers and joggers, and the well-serviced picnic locations are enjoyed by Geelong residents and visitors alike. For more information visit: **https://ccma.vic.gov.au/what-we-do/barwon-through-geelong/**

Credit: Destination Gippsland



Gippsland Lakes

Australia's largest inland waterway, the Gippsland Lakes, are a network of lakes, wetlands and lagoons, fed by five major rivers and connected to the ocean at Lakes Entrance. The lakeside towns of Lakes Entrance, Metung and Paynesville are great places to access sheltered waters for swimming, kayaking, boating, or fishing. There are two national parks adjacent to the lakes, the Lakes National Park and the Gippsland Lakes Coastal Park, which offer great camping and walking tracks. For more information visit: **https://www.visitgippsland.com.au/destinations/east-gippsland/gippsland-lakes**

Figure 3.9: A snapshot of recreational values across the Central and Gippsland Region

The Barwon River is one of Geelong's greatest natural assets, providing important areas for walking, cycling, fishing, hunting, kayaking and rowing. The Yarra, Maribyrnong and Werribee rivers, and the local creeks that flow into them, are major contributors to Melbourne's liveability, encouraging walking, rowing and cycling and providing places to play, reflect and relax.

The catchments of the Gippsland Lakes are highly valued for the recreational experiences they offer, which include kayaking on the Thomson River, boating and fishing on the Gippsland Lakes, fishing on the Latrobe River, and walking, hunting and birdwatching at the wetland areas of Sale Common, Heart Morass and Dowd Morass. East Gippsland's waterways offer pristine and wild spaces to camp, hike, kayak, fish and swim, with public land making up a large portion of the region.

Across the entire Central and Gippsland Region, water storages provide recreational facilities for community use. For example, near Ballarat, visitors can enjoy picnic areas, walking tracks, bike trails and barbecues at Kirks, Gong Gong and Moorabool reservoirs, while further east, water storages such as Lake Glenmaggie, Lake Narracan and Blue Rock Lake are popular for power-boating, fishing and swimming.

Declining surface water availability is reducing the social and recreational values of a number of sites across the Central and Gippsland Region. During previous dry summers there has not been enough water to maintain a continuous flow in the Barwon River through Geelong, leading to the cancellation of major rowing events. Opportunities for water-based recreation are also affected by the quality of the water. Managing the risk that blue-green algae poses to recreational users is a concern for all the waterway managers, and at times requires closure of waterways to the public and cancellation of events. Improvements in land management benefit not only the environment but all users, including recreational users.

Image: Wind surfing at Lake Wendouree Ballarat, Wadawurrung Country

4. Healthy Country, Healthy Mob

This chapter was prepared by the Central and Gippsland Region Sustainable Water Strategy Traditional Owner Partnership, whose members represent the following Registered Aboriginal Party groups:

- **Bunurong Land Council Aboriginal Corporation**
- **Gunaikurnai Land and Waters Aboriginal Corporation**
- **Wadawurrung Traditional Owners Aboriginal Corporation**
- **Wurundjeri Woi-wurrung Cultural Heritage Aboriginal Corporation**

This chapter reflects the insights, main messages and recommendations developed by the Central and Gippsland Region Sustainable Water Strategy Traditional Owner Partnership. We gratefully acknowledge the time, energy and expertise of partnership members: Dr Rohan Henry, Uncle Lloyd Hood, Tim Paton, Lisa Hocking, Michael Cook, Jordan Smith and Karmen Jobling, and their organisations.

4.1 Water rights for Traditional Owners

Water is life

The land, water and waterways of the Bunurong, Gunaikurnai, Wadawurrung and Wurundjeri Woi-wurrung are living entities. They should be recognised as such, and treated accordingly under Victorian law, associated guidance material, letters of obligation and policy.

Traditional Owners know that water is essential to life, and to Creation. The Sustainable Water Strategy Traditional Owner Partners, and the communities they represent, have Dreaming stories and/or Ancestral beings associated with water. The cultural, spiritual, physical and economic health of the Bunurong, Gunaikurnai, Wadawurrung and Wurundjeri Woi-wurrung peoples cannot be separated from the health of their respective Countries, including their water and waterways. Any benefits realised by the Traditional Owner Partnership to improve the health of their Countries will benefit all communities residing within their borders. Healthy water, waterways and Country are good for all.

In order to improve the health of the Traditional Owner communities and Countries represented by the partnership, the legal entitlements to the ownership of water, which have since (un) Settlement almost entirely been denied, must be reinstated, unencumbered by fees. Water entitlements transferred to member organisations of the Traditional Owner Partnership must be sufficient to achieve substantial and measurable outcomes as determined by the communities represented by the partnership.

Concurrent with the transfer of legal titles to water, Bunurong, Gunaikurnai, Wadawurrung and Wurundjeri Woi-wurrung peoples must be resourced to undertake critical foundational work to develop strategies and implementation plans to achieve their respective objectives.

Water is life. No-one knows this more profoundly than the Traditional Owners. In the Central and Gippsland Region, Traditional Owners have managed water on Country for more than 50,000 years, making sure there was enough water to go around for healthy Country, and healthy mob.

Nowadays, government — through its water corporations and catchment management authorities, and its regulators responsible for water quality and pricing — decide how and where water goes, how much, when, and for how long, and Traditional Owners until very recently have been completely denied the right to have a say about water on their Country.

This chapter acknowledges the Victorian Government policy of returning water entitlements to Traditional Owners, and has been developed to guide the reinstatement of such rights and decision-making for Traditional Owners represented by Bunurong Land Council Aboriginal Corporation, Gunaikurnai Land and Waters Aboriginal Corporation, Wadawurrung Traditional Owners Aboriginal Corporation and Wurundjeri Woi-wurrung Cultural Heritage Aboriginal Corporation. It presents Four Principles and other actions to progress Traditional Owner access to water through both entitlement and authority, and to embed on-Country monitoring, evaluation and research designed and undertaken by Traditional Owners in a manner that meets Traditional Owner objectives and, in turn, cultural obligations. It also highlights the need for the water sector to have an obligation to report back to Traditional Owners on how they are meeting those objectives.

> ***Bunurong people belong to Country, as a part of Country water is integral to this belonging. Bunurong people belong to the water of a place.***
>
> ***Caring for Country also has a flow-on effect for Bunurong people. By keeping Country healthy and in balance, Country would then also care for the people. As Country is not passive it is able to provide everything required to survive and thrive. However, if Country is not cared for it can also cause harm to the spiritual and cultural health and mental wellbeing of Bunurong people.***
>
> — Bunurong Land Council Aboriginal Corporation

Water is very important — I suppose it's important to everyone now today, but it's always been the very core of our existence.

— Uncle Lloyd Hood, Gunaikurnai Land and Waters Aboriginal Corporation

We hold moral obligations to the health of Country, it's what we're taught from a young age.

— Michael Cook, Wadawurrung

For me walking in these sands is recreating and walking in the footsteps of my ancestors in the past. It's about connecting, reconnecting, and their spirits guide you and take you to these places that they've accessed and used for over forty thousand years.

— Robert Ogden, Bunurong

Balliyang, barnumbinyu Bundjilal, banyu bagurrk munggany. Ngarn gunganyinu nhanbu nyilam biik, nyilam kuliny — balit biik, balit kuliny: balitmanhanganyin manyi biik ba Birrarung. Balitmanhanganyin durrungu ba murrupu, ba nhanbu murrondjak! (Bunjil's brother, Palliyang, the Bat, created Bagarook, women, from the water. Since our beginning it has been known that we have an obligation to keep the Birrarung alive and healthy — for all generations to come).

— Wurundjeri Woi-wurrung Cultural Heritage Aboriginal Corporation

Image: Sale Common wetlands, Gunaikurnai Country

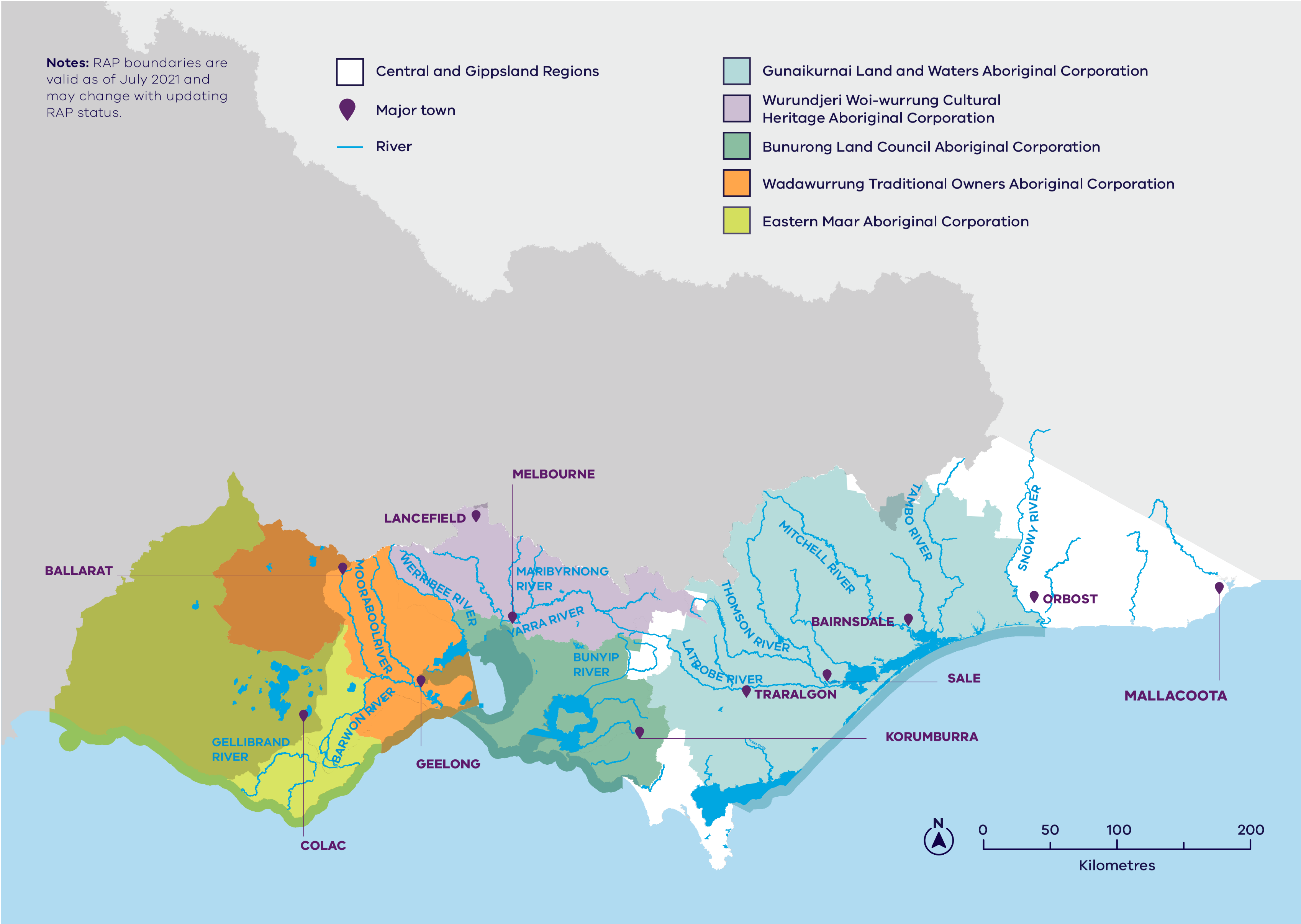


Figure 4.1: The Registered Aboriginal Parties (RAPs) of the Central and Gippsland Sustainable Water Strategy (draft).
The RAP boundaries are current at 30 June 2021, and will be updated to reflect changes to RAP boundaries in effect from 1 July 2021

The Traditional Owner Partnership

The Central and Gippsland Region Sustainable Water Strategy is the first Sustainable Water Strategy to formally include Traditional Owners as members of the consultative committee, alongside other representatives from the water sector, and the Department of Environment, Land, Water and Planning. This chapter has been written by the Traditional Owner Partnership, formed by Bunurong Land Council Aboriginal Corporation, Gunaikurnai Land and Waters Aboriginal Corporation, Wadawurrung Traditional Owners Aboriginal Corporation and Wurundjeri Woi-wurrung Cultural Heritage Aboriginal Corporation.

Through the Strategy, the Victorian Government and the Traditional Owners of the region have agreed to work in partnership to ensure that Traditional Owners' water needs are considered alongside those of other water users in the discussion about water availability and sharing.[10] In its role in the Strategy, the partnership has endeavoured to:

- amplify Traditional Owner voices and perspectives in the Sustainable Water Strategy
- identify and express barriers to Traditional Owners holding water in Victoria's consumptive-based water-entitlement framework
- work with government to determine what changes to instruments and tools are required for water to be held and used flexibly by Traditional Owners
- identify what needs to occur to protect any ensuing Traditional Owner water entitlements from competing pressures
- help government articulate how 'Health Country, healthy mob' and self-determination will be realised in government legislation, agreement-making, policy, and Strategy implementation.

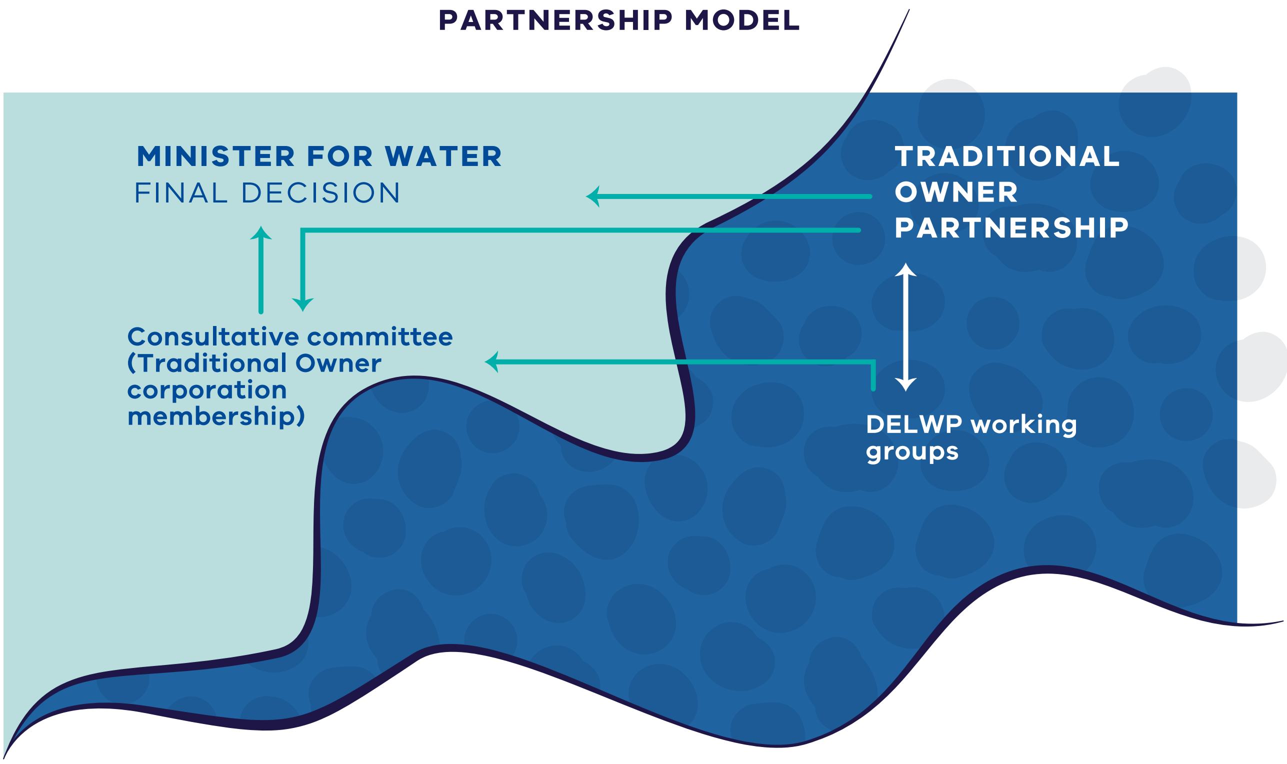


Figure 4.2: Traditional Owner groups are embedded in all levels of the Central and Gippsland Region Sustainable Water Strategy governance structure

10 This chapter currently represents the views of Bunurong Land Council Aboriginal Corporation, Gunaikurnai Land and Waters Aboriginal Corporation, Wadawurrung Traditional Owners Aboriginal Corporation and Wurundjeri Woi-wurrung Cultural Heritage Aboriginal Corporation, who together agreed to work alongside the Department of Environment, Land, Water and Planning and the water sector to incorporate Traditional Owner objectives in the Sustainable Water Strategy.

The Traditional Owner Partnership identified the main aims to include in the Strategy in line with each Traditional Owner Corporation's water objectives and to progress the Victorian Government Aboriginal Water Policy. No policy in the Strategy should dictate a path for individual Traditional Owner groups. Instead, the Strategy should enable each Traditional Owner group to realise its priorities for water in a way and within a timeframe that best suit the priorities and objectives of that group, and the Traditional Owner community it represents.

Each Traditional Owner group will work directly and independently with the government regarding place-based discussions about their Country.

Redressing an unjust history

The Bunurong, Gunaikurnai, Wadawurrung and Wurundjeri Woi-wurrung peoples have never ceded rights to land and waters. Cultural responsibilities to care for Country have been denied by the historical segregation of Traditional Owners from water policy, management and planning in Victoria. This has had severe and compounding ramifications for healthy Country and for the health and wellbeing, including the economic wellbeing, of all Traditional Owners, and has contributed to unsustainable water management practices — which affect everyone.

Across Australia, Aboriginal peoples have had rights to water taken away. In Victoria it is estimated that Aboriginal people own less than 0.1% of all water rights. Without water rights, including water entitlements, Traditional Owners are unable to exercise self-determination. Without water entitlements, Traditional Owners cannot mandate where or how water can be used to support cultural, spiritual, environmental or economic outcomes. This exclusion denies Traditional Owners the right to care for Country, which is the essence of Aboriginal social, spiritual, economic and physical wellbeing, and the basis of cultural lore.

Traditional Owners are not the first in line with the bucket. We're way down behind everyone else. So we're not even considered most of the time. All the time. And we need to change that. We want to be first in line.

— Uncle Lloyd Hood, Gunaikurnai Land and Waters Aboriginal Corporation

Victoria has begun the process of handing water entitlements back to Traditional Owners (**Figure 4.2**). The Sustainable Water Strategies are an important tool to enable the Victorian Government to work in genuine partnership with Traditional Owners, to understand and decide upon actions to achieve tangible benefits for Traditional Owners, including restoration of water rights. The Central and Gippsland Region Sustainable Water Strategy will reflect the value of water to the health, wellbeing and economic outcomes of Traditional Owners, by enabling self-determination in water management.

Image: Royal spoonbills and cormorants perched on tree in the Mitchell river, Bairnsdale, Gunaikurnai Country

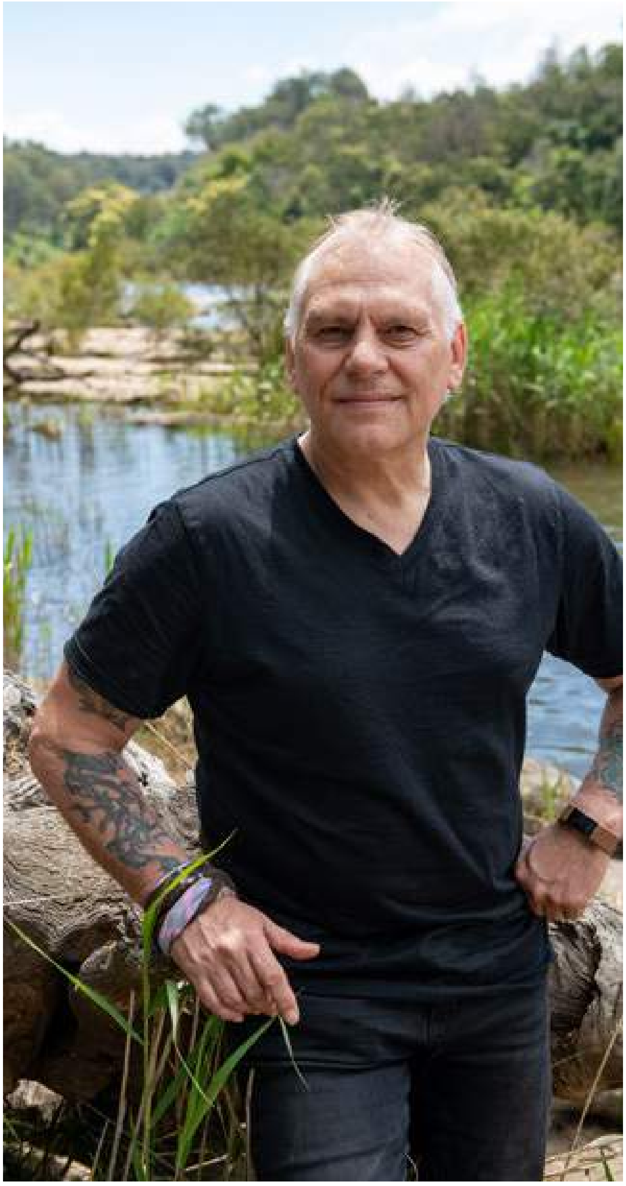


Image: Troy McDonald, Chair of Gunaikurnai Land and Waters Aboriginal Corporation (Credit: Gunaikurnai Land and Waters Aboriginal Corporation)

In November 2020, the first formal hand-back of water rights to Traditional Owners by the Victorian government was accomplished. Gunaikurnai Land and Waters Aboriginal Corporation (GLaWAC) will receive 2 GL on the Mitchell River in south-eastern Victoria. This is a 'momentous outcome' (Roger Fenwick, CEO GLaWAC) and an essential first step towards water justice.

This water will be in the form of 51 'winterfill' licence (meaning that water can only be extracted from the river during the high flow winter-spring period). Roger Fenwick, GLaWAC CEO said that this commitment

> ***'recognizes the importance of gaining rights to water to restore customary practices, protect cultural values and uses, gain economic independence and heal Country.'***

In committing to this transfer of water to GLaWAC, Lisa Neville, the Minister for Water reiterated her commitment to Aboriginal participation in water management:

> ***'I want to see the water sector and Traditional Owners working closely together, with water entitlements supporting business, cultural, recreational and environmental outcomes for Aboriginal communities and the broader region.***

The Minister also acknowledged Traditional Owners' long history of sustainable water management:

> ***Traditional Owners have cultural, spiritual, and economic connections to land, water and resources through their relationship with Country - having managed land and water sustainably over thousands of generations.***

Figure 4.3: Water handback to Gunaikurnai on the Mitchell River (O'Donnell *et al., 2021*)

4.2 Sovereignty and self-determination

Traditional Owner sovereignty and self-determination in water are a foundation for water management in Victoria. Each Traditional Owner expresses this relationship with water slightly differently. Some examples from each of the partnership organisations are set out below.

Image: Darebin Creek, Darebin Parklands, Wurundjeri Woi-wurrung Country

Bunurong

As Traditional Owners, we never considered our right to water until that right was taken away. Australia has one of the biggest water markets in the world, worth billions, yet for a long time it seemed Aboriginal water entitlements continued to shrink. While we make up around 3% of the population, we retain rights to a much smaller percentage of available water. If we want to live on our own Country, we must buy land back from those who benefited from its theft. If we want water, we must pay companies that have impacted our land and cultural sites by piping water here and there, for the convenience of their customers. The Government's overall management of that water has led to diminished volumes, higher prices, lower quality of life for people in many areas and a biodiversity imbalance. Aboriginal people deserve to also be able to enjoy the benefits of water rights as not only a basic human right, but as part of their obligation as Traditional Owners, or custodians of Country. Our custodianship is a human right, but it's also an inherited obligation we have as Aboriginal people. For us to have water rights within Bunurong Country, means that once again we can continue to care for Country in ways we were not able to before; bringing cultural flows back to dry creeks and tributaries and assisting with the biodiversity issues caused by bad planning and decision making in the past. It also allows us to take part in the broader water economy, which is long overdue. We can't live without water and Country cannot function without water. For Bunurong people to have water rights, is a turning point; a marker in time that shows us that our role on Country is respected, and important, and as one part of the oldest continued culture on this planet.

— Bunurong Land Council Aboriginal Corporation

Image: Bass River, Bass, Bunurong Country

Notes: RAP boundaries are valid as of July 2021 and may change with updating RAP status.

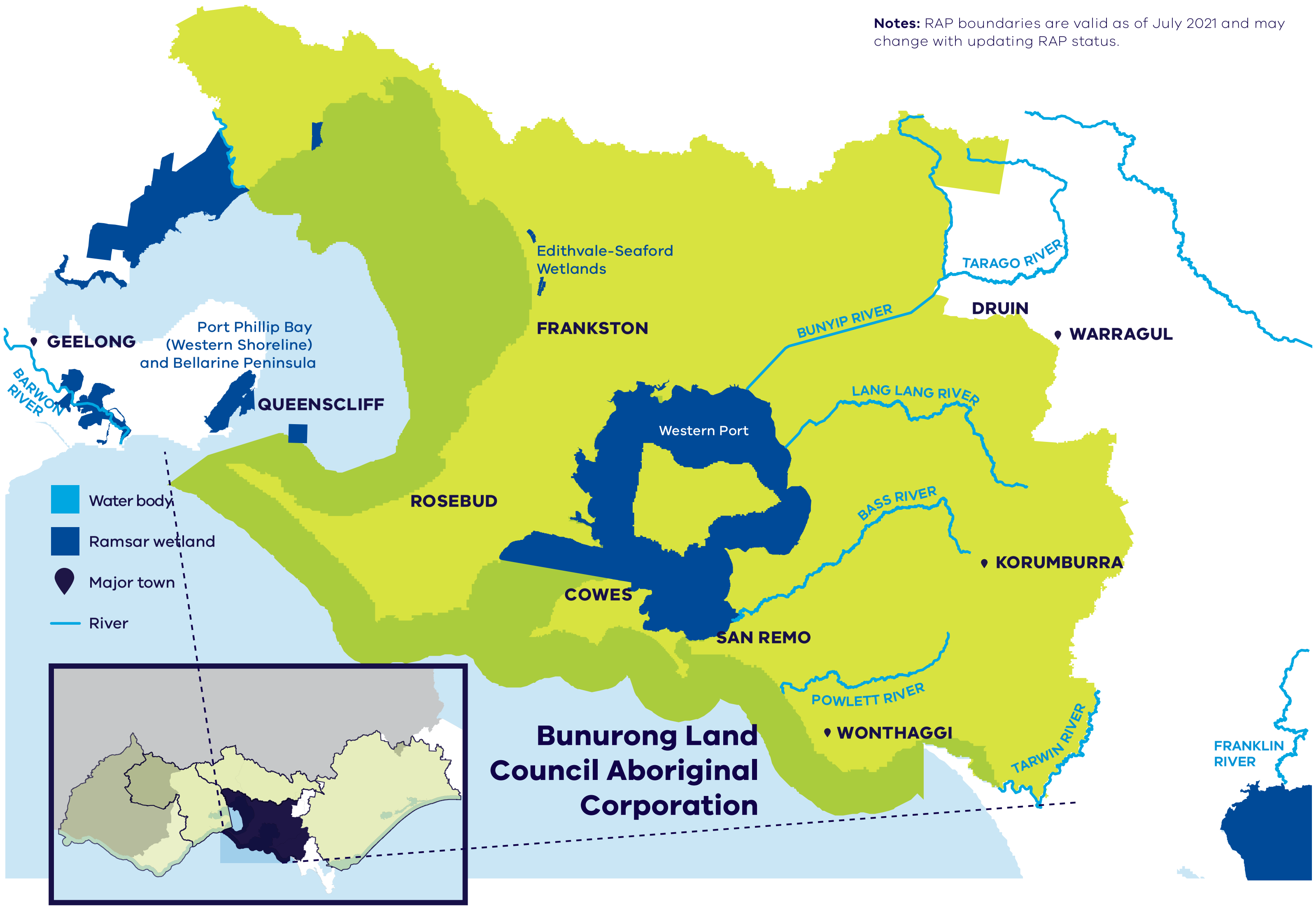


Figure 4.4: The Registered Aboriginal Party (RAP) area of Bunurong Land Council Aboriginal Corporation. The RAP boundary is current at 30 June 2021 and will be updated to reflect changes to the RAP boundary in effect from 1 July 2021

Gunaikurnai

As Gunaikurnai, we see our land (Wurruk), waters (Yarnda), air (Watpootjan) and every living thing as one. All things come from Wurruk, Yarnda and Watpootjan and they are the spiritual life-giving resources, providing us with resources and forming the basis of our cultural practices. We have a cultural responsibility to ensure that all of it is looked after.

— Gunaikurnai Whole of Country Plan, 2015

Image: Mitchell River, Gunaikurnai Country

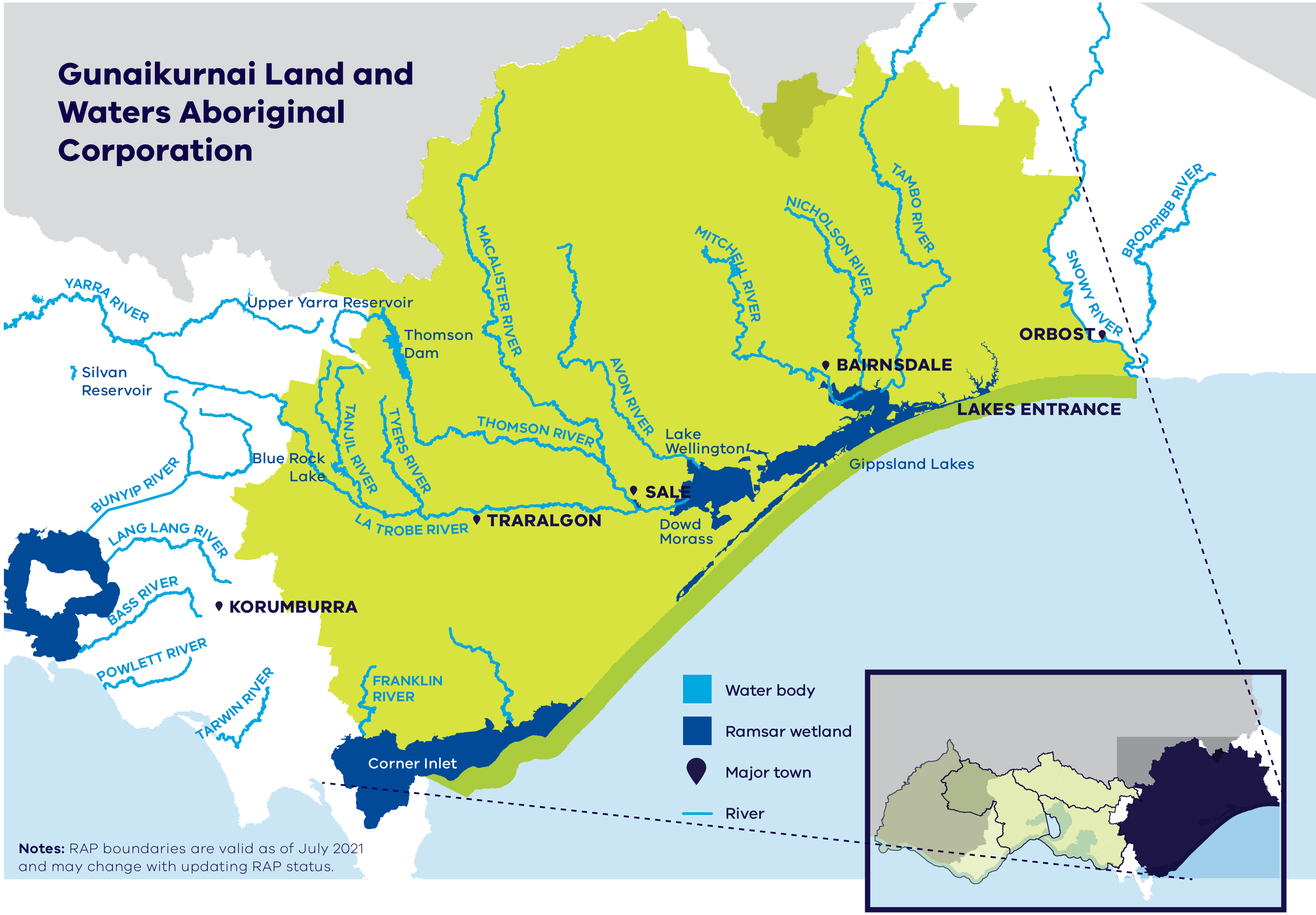


Figure 4.5: The Registered Aboriginal Party (RAP) area of Gunaikurnai Land and Waters Aboriginal Corporation. The RAP boundary is current at 30 June 2021 and will be updated to reflect changes to the RAP boundary (if applicable) in effect from 1 July 2021

Wadawurrung

Our main river systems are the Barwon/ Moorabool, Yarrowee and Leigh rivers or Barre Warre Yulluk. Yulluk (great river) that runs from the Barre (mountains) to the Warre (ocean), and our stories tell of these connections. The name Barwon is derived from Parwan meaning 'magpie' or 'great wide'.

The chain of ponds from the Barwon River to Reedy Lake, Hospital Lake, Lake Connewarre and Estuary Bay is connected through water and our Connewarre (Black Swan) Dreaming. The Connewarre Wetland Complex is internationally significant for wader and shoreline birds and forms part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar Site. Our waterways were like our highways, they were how Wadawurrung people moved around Country.

Our people used canoes or in calmer waters, Murriyans bark floats, or punts pushed by long poles to gather the abundance of food. On the natural rises along the waterways our people camped and caught eels, other fish and waterbirds to eat. Important decisions were made on the banks of these waterways by our Ancestors. They were important living and meeting places. Just as they are today.

— Paleert Tjaara Dja, Let's make Country good together 2020–2030 (Wadawurrung Country Plan)

Image: Moorabool River, Wadawurrung Country

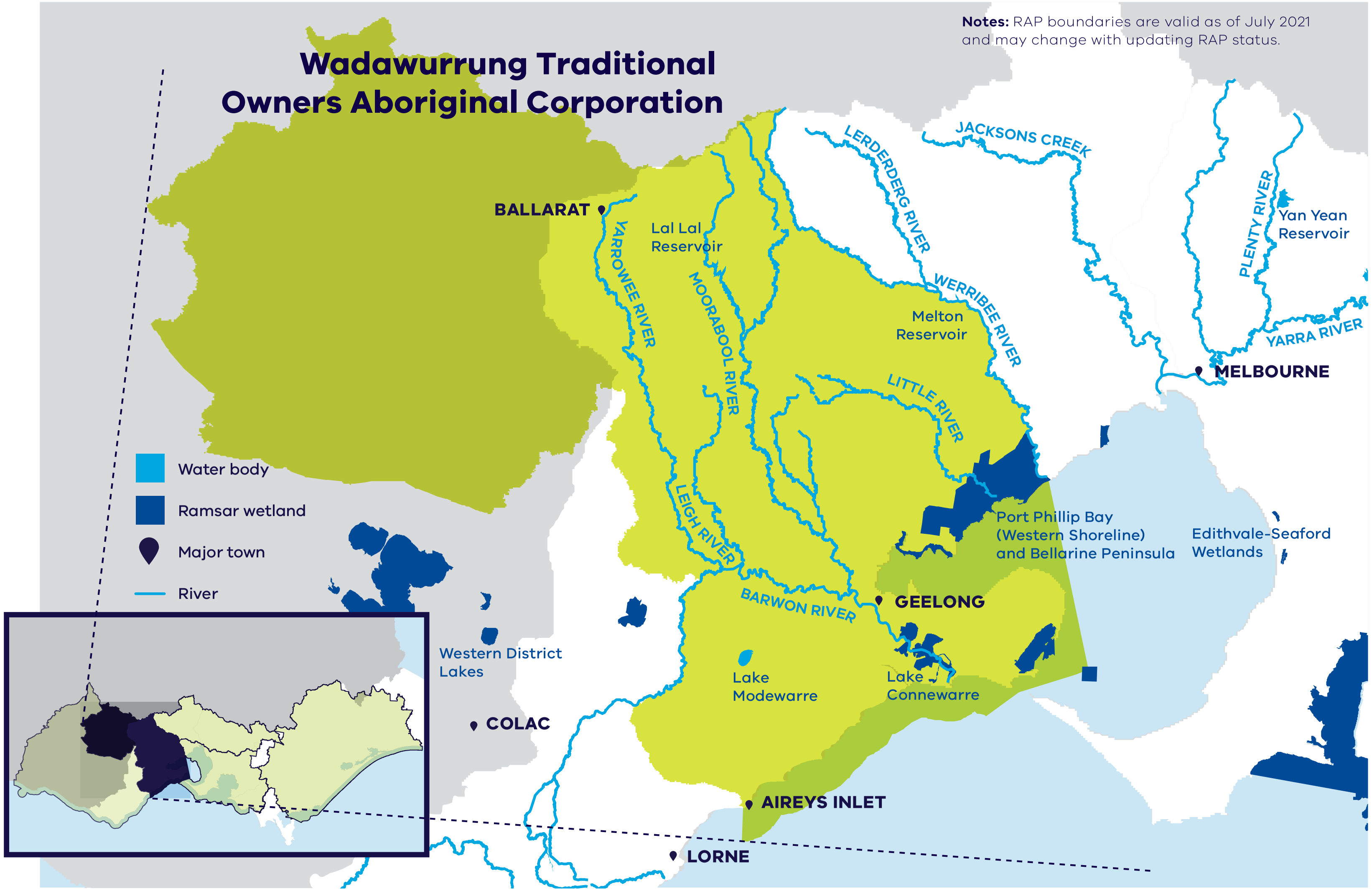


Figure 4.6: The Registered Aboriginal Party (RAP) area of Wadawurrung Traditional Owners Aboriginal Corporation. The RAP boundary is current at 30 June 2021 and will be updated to reflect changes to the RAP boundary (if applicable) in effect from 1 July 2021

Wurundjeri Woi-wurrung

> *Woiwurrungbaluk ba Birrarung wanganyinu biikpil. Yarrayarrapil, manyi biik ba Birrarung, ganbu marram-nganyinu. Manyi Birrarung murrondjak, durrung ba murrup warrongguny, ngargunin twarnpil. Birrarungwa nhanbu wilamnganyinu. (We, the Woi-wurrung, the First People, and the Birrarung, belong to this Country. This Country, and the Birrarung are part of us. The Birrarung is alive, has a heart, a spirit and is part of our Dreaming. We have lived with and known the Birrarung since the beginning).*
>
> — *Yarra River Protection (Wilip-gin Birrarung murron) Act 2017,* preamble from Wurundjeri Woi-wurrung Cultural Heritage Aboriginal Corporation

Image: Dights Falls on the Yarra River, Abbotsford, Wurundjeri Woi-wurrung Country

Figure 4.7: The Registered Aboriginal Party (RAP) area of Wurundjeri Woi-wurrung Cultural Heritage Aboriginal Corporation. The RAP boundary is current at 30 June 2021 and will be updated to reflect changes to the RAP boundary in effect from 1 July 2021

The quadruple bottom line

Managing water holistically to care for Country and people brings great benefits to everyone living in the region: healthy rivers, happy and healthy people, and thriving towns and regions. The Traditional Owner Partnership is developing a framework to express the wide range of benefits that flow from increasing Traditional Owner ownership and management of water in the Central and Gippsland Region.

The quadruple-bottom-line approach takes into account not only economic or financial results or benefits, but also social, environmental and cultural factors and outcomes. Consideration of all four elements should bring community wellbeing, prosperity and jobs (**Figure 4.8**).

Figure 4.8: The elements of the quadruple-bottom-line approach

Caring for Country, including its waterways and water bodies, is the custodial obligation of Traditional Owners, handed down over countless generations. Managing the health of Countries (and governing communities) has been a foundational responsibility of Traditional Owners. However, these rights have been largely denied in the Central and Gippsland Region since European (un)Settlement.

All Victorians and water users must work together to secure water for the 50-year planning period of the Strategy, and beyond. Long-term planning is required. No-one knows this better than Traditional Owners, who managed Country sustainably for tens of thousands of years.

Caring for Country, which includes caring for water and waterways, benefits all Victorians. Traditional Owners have successfully cared for Country for many thousands of years. When Country is cared for, it is healthy, its resources are shared equitably, it supports healthy people and economies, and it provides an environment that can be enjoyed by everyone.

It's part of us, we're taught not to take more than we need.

— Tim Paton, Gunaikurnai Land and Waters Aboriginal Corporation

That's part of our Aboriginal upbringing. Don't take too much of the fish stocks, don't take too much because there's always other people that would come behind. We travelled a lot, there was always another clan group coming behind us, so it was important that there was something left. And they would then do the same for others.

— Uncle Lloyd Hood, Gunaikurnai Land and Waters Aboriginal Corporation

The Strategy will play a significant role in returning water entitlements to Traditional Owners, as well as strengthening and developing agreement-making between Traditional Owners, water authorities and other government agencies. To do so, the proposed Strategy actions will:

- increase Traditional Owner access to water entitlements
- remove barriers to Traditional Owners' use of water
- support partnerships between Traditional Owners and water managers
- establish longer term goals for place-based, integrated land and water management.

4.3 Four Principles to guide allocation of water to Traditional Owners

As water becomes available, the Strategy should guide the return of water to Traditional Owners. The following Four Principles have been developed by the Traditional Owner Partnership, and endorsed by the Strategy's consultative committee as actions for the Strategy:

- Each Traditional Owner will receive entitlements to water in rivers and aquifers on their Country. Where a water source is shared between more than one Traditional Owner group, water rights on that water source (river, aquifer) will be similarly shared.

  What this means: Each Traditional Owner has the responsibility to care for their Country. Although water can now be moved between catchments through pipes and tunnels, Traditional Owner responsibility for water is located in the source of the water and its movement through rivers and aquifers on and through Country.

- Where more than one party claims an interest in new water entitlements for a river or aquifer (via water substitution, unallocated water and formerly allocated water), Traditional Owners will receive an equal share of the available water.

What this means: Where there is competition for unallocated or newly freed up water, Traditional Owners will receive an equal share. For example, where there is interest from irrigators, towns, mining, the environment and Traditional Owners, the Traditional Owners will receive one-fifth (20 per cent) of the available water.

- The share of unallocated water going to Traditional Owners should be allocated as a matter of priority (without waiting for remaining shares to be allocated via auction processes or similar).

  What this means: Unallocated water is water that is known to be available for allocation at the present time. Given the historical exclusion of Traditional Owners from water rights in Victoria, Traditional Owners should receive their share of this water as soon as possible..

- Water substitution arrangements that free up water in rivers for Traditional Owners should be pursued in water systems on the Country of each Traditional Owner group.

  What this means: Where possible, each Traditional Owner group represented on the Traditional Owner Partnership should benefit from the investment in new sources of water that can free up water to remain in rivers and aquifers on Country as entitlements held by Traditional Owners.

4.4 Water rights

> ***Access to water for Wadawurrung Traditional Owners is a major aspiration for us. It enables economic development for the Wadawurrung but it also meets obligations around the overall health of the Country. This also contributes to self-determination.***
>
> — Michael Cook, Wadawurrung

Cultural flows are water entitlements that are owned or managed by Traditional Owners in accordance with their own laws and cultural protocols. Each Traditional Owner group will determine how to use its own water entitlements, including caring for Country and cultural heritage, providing for healthy people and wellbeing, and delivering economic benefits and sustainable development.

Groundwater, like all water sources, is very important to Traditional Owners. However, to date, discussions with government on cultural values and uses of water have focused on surface water, not groundwater. This does not reflect the cultural value of groundwater. The Strategy gives the opportunity to acknowledge the cultural importance of protection of groundwater to Traditional Owners and bring this important natural resource into the discussion. It is proposed that Traditional Owners must be included in the assessment of any future applications for groundwater extraction and transfer (both within and between Traditional Owner Countries).

Water rights and entitlements in Victoria

Water rights are defined and allocated under Victoria's *Water Act 1989*:

- ***section 8 rights*** — the right to take water from a waterway, groundwater bore, spring, soak or dam on or adjacent to the landholder's property, for domestic and stock purposes (no fees and charges).
- ***section 8A rights*** — the right of Traditional Owners to take water from a waterway, groundwater bore, spring, soak or dam on or adjacent to land that is the subject of a Traditional Owner Settlement Agreement, for purposes related to the cultural values and uses specified in the agreement (no fees and charges). These rights are expressed in Traditional Owner Settlement Agreements. Currently none of the Traditional Owner Partnership corporations is able to access section 8A rights, as the process requires both having a Recognition and Settlement Agreement, and having section 8A rights written into that agreement.
- ***section 51 licence*** — the right to take water from a waterway, dam or groundwater bore under the conditions specified on the licence (including a specific location for use). This licence can be transferred to another user (traded), and includes fees and charges for water use.
- ***water share*** — the right to receive water allocations in a declared water system (such as the Thomson-Macalister system). Water share owners do not need to own land, water shares can be transferred (traded), and there will be annual fees for water share ownership.
- ***water allocation*** — the physical water available under a water share, allocated by a water corporation in a declared system. Water allocation owners do not need to own land (unless they wish to use the water on land), water allocation can be transferred (traded), and there will be annual fees for water use.

Other rights may also be necessary (such as a water-use registration, which enables water to be used on land; a works licence, which enables infrastructure such as a water pump or a groundwater bore to be constructed; or a delivery share, to receive water through a water corporation's infrastructure).

4.5 Traditional Owner share of water

Unallocated water

Across Victoria, most surface and groundwater systems are fully allocated, which means that no new water rights can be issued without:

- compromising the future sustainability of the water resource
- freeing up surface water and groundwater through substitution
- reallocating water that was allocated for a purpose that no longer exists. Unallocated surface water volumes are illustrated in **Figure 4.9**. Unallocated groundwater volumes are illustrated in **Figure 4.10**.

Notes: The volume of unallocated surface water is the total volume of unallocated water available across the catchment area. The distribution of available water within each catchment will vary, and a local assessment is required to determine if there is any unallocated water available at any particular location.

For catchments in the CGRSWS area that were outside of the 2011 Gippsland and Western Region Sustainable Water Strategy areas, including the Bass River and Lang Lang River catchments, the volumes of unallocated surface water available have been revised consistent with the approach taken in the 2011 strategies. This includes consideration of the risks posed by climate change, and a range of sustainability principles (refer to Policy 3.1 of the 2011 Gippsland Region Sustainable Water Strategy). The revised volume available is 300ML in the Bass River catchment, 200ML for French Island and 100ML for the coastal catchment between Lang Lang River and Bass River catchments. The revised volume available in the Lang Lang River catchment is proposed to be 500ML.

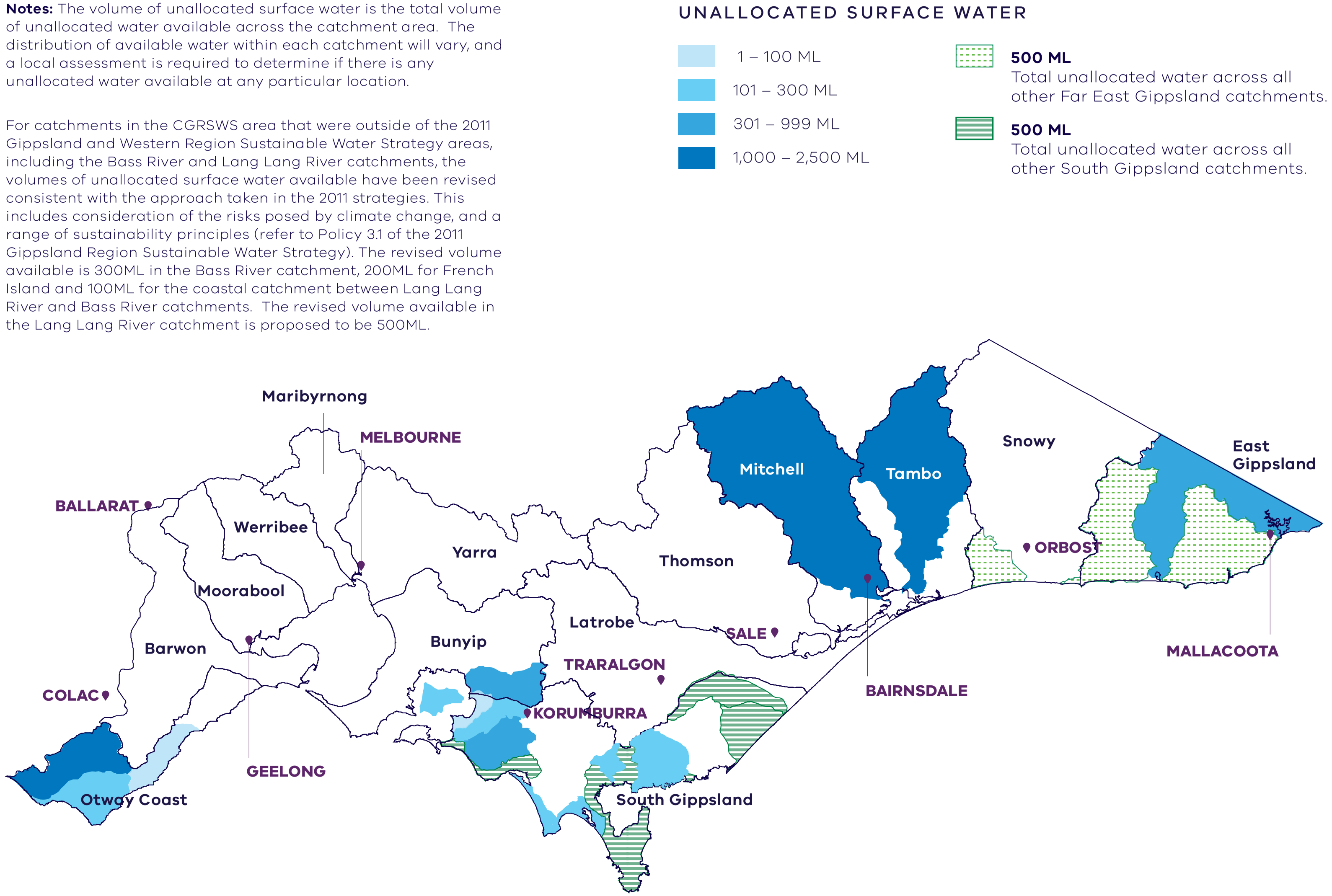


Figure 4.9: Unallocated surface water volumes in the Central and Gippsland Region

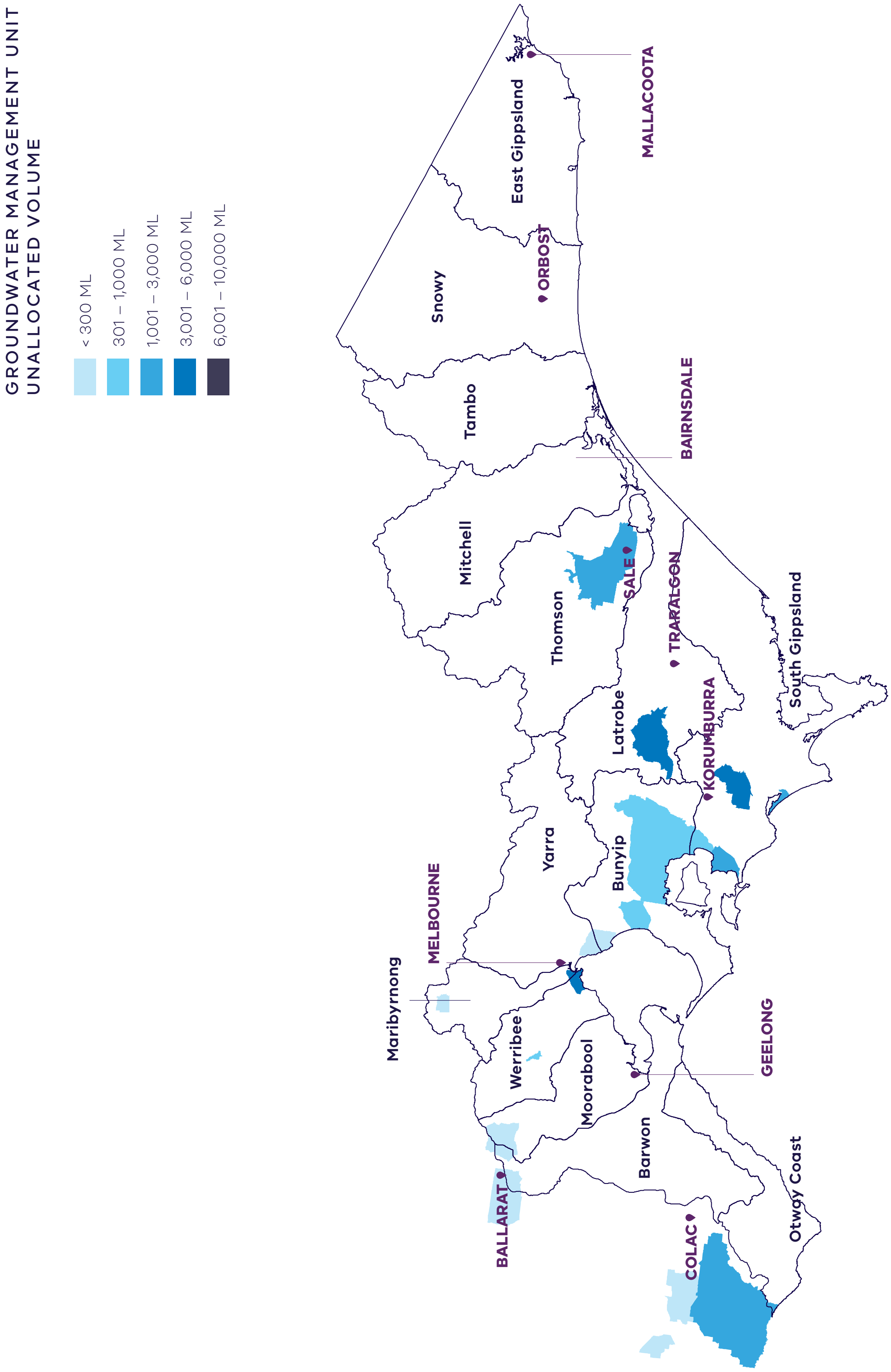


Figure 4.10: Unallocated groundwater volumes (groundwater management units, GMU) across the Central and Gippsland Region

Proposal 4-1:

- **It is proposed that the final Strategy determine the share of the unallocated water in each of these locations that will be allocated to Traditional Owners, in accordance with the Four Principles.**

Unallocated water exists at many locations across the Central and Gippsland Region. **Chapter 8** outlines proposed principles to guide the allocation of water to Traditional Owners as water becomes available across the Central and Gippsland Region.

After the share of the volume for Traditional Owners has been determined, this is to be allocated to the relevant Traditional Owners as a matter of urgency — if necessary, in advance of other water allocation processes. This water will be allocated to Traditional Owners as the most appropriate form of water entitlement, most likely under a section 51 licence, as cultural water (unless otherwise specified by the relevant Traditional Owners).

In addition, future studies may identify further volumes of water that can be allocated. To remedy the historical exclusion of Traditional Owners from water rights, after the share of the volume available to Traditional Owners has been determined, the relevant water corporation will complete the process by allocating this water to the relevant Traditional Owners under the appropriate licensing system.

Water handback opportunity: the Birrarung

The Birrarung has always been central to our identity. In addition to supporting Wurundjeri Woi-wurrung people's social, spiritual, and cultural wellbeing prior to European contact, the river provided a basis for our trade and economic prosperity. Moving forward we will be seeking support from the State Government ... for a dedicated water allocation. Once attained, this water will be used to support Wurundjeri Woi-wurrung people's cultural and economic health into the future.

— Wurundjeri Woi-wurrung Cultural Heritage Aboriginal Corporation, 2017

Water entitlements can be returned to Traditional Owners by 'gifting' water rights currently held by other parties or individuals. In 2012, after the Amcor facility (paper mills) on the banks of the Birrarung (Yarra River) in the Melbourne suburb of Fairfield was decommissioned, the company sought opportunities to 'gift' its water licence of 2.2 gigalitres. In 2015, 0.1 gigalitres of this was transferred to the Royal Botanic Gardens and, in 2017, 0.7 gigalitres was transferred to the City of Melbourne. Rights to the remaining 1.4 gigalitres are currently held by the Department of Environment, Land, Water and Planning.

Wurundjeri Woi-wurrung have formally expressed their interest to the Department of Environment, Land, Water and Planning and Melbourne Water in the remaining 1.4 gigalitres. They have also requested a review of the decisions to allocate water to the Royal Botanic Gardens and the City of Melbourne, on the grounds that they have never ceded their rights to water, and at least one of these allocation decisions (City of Melbourne) occurred after Water for Victoria required water corporations to notify Traditional Owners when opportunities to obtain water entitlements arise. Wurundjeri Woi-wurrung are consequently requesting that the full 2.2 gigalitres be allocated to the Wurundjeri Woi-wurrung Cultural Heritage Aboriginal Corporation.

Proposal 4-2:

- **It is proposed that entitlement to 1.4 gigalitres of water in the Birrarung be returned to Wurundjeri Woi-wurrung Cultural Heritage Aboriginal Corporation, and that the Victorian Government complete a formal review of the allocation decision for the remaining 0.7 gigalitres.**

Water substitution

Water substitution arrangements enable water from new sources (recycled water, treated stormwater and future desalinated water) to be used instead of river water. **Section 8.1** of the Strategy identifies an adaptive approach for water substitution arrangements as part of water supply augmentations to meet emerging and future supply and demand requirements.

There is a strong case for increasing Victoria's reliance on new, climate-independent water sources. As noted by the Victorian Government's Long-Term Water Resource Assessment, water security across the Central and Gippsland Region is already declining significantly. In a future where water resources are becoming more and more scarce, climate-independent water sources will be increasingly valuable.

New climate-independent sources of water (recycled water and desalination) are being prioritised for industry, irrigation and urban use, to reduce reliance on river flows. To avoid repeating the mistakes of the past, through which Traditional Owners were excluded from water ownership, it is necessary to ensure that Traditional Owners also have access to climate-independent sources of water should they wish, to support self-determination and economic development in the future.

For these reasons, it is proposed that Traditional Owners be considered as recipients of a portion of these new, highly reliable water sources as they become available, if Traditional Owner groups are interested. This share would not necessarily be an equal share as outlined in the Four Principles, but would be determined on a case-by-case basis, taking into consideration the restorative justice approach of the Strategy and the size and purpose of the augmentation.

Proposal 4-3:

- **It is proposed that all future business cases for investment in new sources of water include a commitment to hand back a proportion of water to Traditional Owners on the completion of these substitution projects. The timeline for the completion of these projects will be included in the Sustainable Water Strategy implementation plan.**

Proposal 4-4:

- **It is proposed that water returned to rivers and creeks as a result of substitution by alternative water sources will be shared equally between the environment (the Victorian Environmental Water Holder) and Traditional Owners.**

  What this means: Where new, climate-independent water sources are created to serve towns, irrigation and industry, this water will not only be used to meet future water needs but will also be used to reduce the volumes of water extracted from creeks and rivers.

Water substitution on the Werribee and Lerderderg rivers

One of the proposals in this draft Strategy includes using treated, fit-for-purpose recycled water to substitute for irrigation in the Werribee Irrigation District and the Bacchus Marsh Irrigation District (see **Chapter 11**). The water that was once used for irrigation would become available for urban, environment and Traditional Owner uses (Wadawurrung and Wurundjeri Woi-wurrung). Traditional Owner entitlements should be realised through this process, and a quadruple-bottom-line assessment could bring about a fair and equitable entitlement split of any water made available. The benefits to Traditional Owners, as well as to the wider community, from increasing Traditional Owner water ownership and management will be expressed as part of the new framework being developed by the Traditional Owner Partnership.

Proposal 4-5:

- **It is proposed that the business case for the recycled water substitution project in the Werribee and Bacchus Marsh irrigation districts include the benefits to Traditional Owners of receiving an equitable proportion of water saved as a result of water substitution.**

4.6 Removing barriers to water rights

The range of water rights that Traditional Owners may hold in Victoria under the Entitlement Framework (see **Section 4.4**) come with constraints over how the water can be held and used by Traditional Owners.

> *We have to navigate this system that's been established by a society that has impacted our Country. And at the end of the day, that Country used to belong to us, and now we have to jump through these hoops to secure water, and it's not fair.*
>
> — **Michael Cook, Wadawurrung**

Even when water entitlements are held by Traditional Owners, current Victorian law places significant barriers in the way of Traditional Owners using that water.

Most fundamentally, Victorian water law treats water as a commodity. This disconnects water from Country and from its Traditional Owners, and is a profound problem for Traditional Owners' management of water.

In the Central and Gippsland Region, the section 51 licence water right requires reform, in order to remove significant impediments for Traditional Owners, such as:

- short-term ownership — Traditional Owners require water rights in perpetuity
- fees and charges — fees and charges are set according to economic return. Traditional Owners' use of water may not produce either a direct or commensurate financial return, which makes it impossible to pay these fees
- land access — section 51 licences must be associated with land, and a single point of take. Not all Traditional Owners have land rights, and even where Native Title or a Traditional Owner Settlement Agreement does exist, these arrangements must be more flexible, rather than fixed to one take-and-use point, in order to bring cultural benefits.

Our greater understanding of the barriers that prevent Traditional Owners from holding water under a section 51 licence has come largely from the handback of water to the Gunaikurnai. For the Strategy to remove barriers in ways other than through a section 51, the Traditional Owner Partnership will work with the water sector to develop actions for the final Strategy.

Proposal 4-6:

- **It is proposed that the Traditional Owner Partnership work with the water sector to recommend ways to remove barriers to water rights, including section 51 licences.**

Fees and charges

Water licences and water shares require the payment of annual fees. Traditional Owners use water in numerous ways, many of which do not generate a direct financial return. This makes it very difficult for Traditional Owners to pay fees and charges associated with water use. In other states of Australia, this has led to a decline in an already low level of water entitlements held by Traditional Owners, who have had to sell their water to cover these fees. Where water is used for cultural purposes, which are defined as being not purely commercial uses (such as irrigation as part of an established, for-profit enterprise, or the temporary trade of water), Traditional Owners should not be charged water-use fees. This is currently the agreed position of Southern Rural Water through a board decision made in 2020 before the handback of 2 gigalitres of water to the Gunaikurnai on the Mitchell River. This waiving of fees is an essential step towards water justice and self-determination for Traditional Owners in the Central and Gippsland Region.

Proposal 4-7:

- **It is proposed that, where Traditional Owners in the Central and Gippsland Region hold section 51 licences expressed as 'cultural water', there will be no annual fees or water usage charges.**

Access to land

Applications for section 51 licences require the applicant to specify the land on which the water will be used. However, not all Traditional Owners have rights to land, which can be Native Title, freehold land or Traditional Owner Settlement Agreement.

There needs to be an urgent review of section 51 licence regulations to create more flexibility for Traditional Owners to nominate the land with which the licence would be associated. In the short term, Traditional Owners should also be able to establish an access agreement with a landholder (such as Parks Victoria, the Department of Environment, Land, Water and Planning, local government, a water corporation or a private landholder) for the purposes of allocating water to Traditional Owners under a section 51 licence.

Proposal 4-8:

- **It is proposed that, where Traditional Owners do not hold rights to land (via Native Title, Traditional Owner Settlement Agreement or freehold), they may nominate land for the purposes of the section 51 licence to which they have an access agreement with the landholder (such as Parks Victoria, the Department of Environment, Land, Water and Planning, local government, water authorities or private landholders).**

Proposal 4-9:

- **It is proposed that, where Traditional Owners do not have existing access agreements, this process be expedited as part of the SWS.**

4.7 Enduring partnership agreements with Traditional Owners

Through the SWS process I think we can achieve these goals together. At the moment, we rely on partnerships and support, but at the end of the process we kind of hope that we won't need any more support to secure water for us and our family.

— Michael Cook, Wadawurrung

Our aspiration is to be structurally involved in each level of government regarding the decision making and management of our lands and waterways. We want this to be standard practice, not the exception.

— Aunty Margaret Gardiner,
Wurundjeri Woi-wurrung Elder

Water for Country is about much more than the ownership of water by Traditional Owners. The Traditional Owner Partnership has developed a wide range of objectives for sustainable, long-term water management across the Central and Gippsland Region. The heart of this transformative approach is the creation of true partnerships between water authorities and Traditional Owners. This is the only way to ensure that Traditional Owners are genuinely understood to be, and treated as, rights holders — not stakeholders — and to comply with the Department of Environment, Land, Water and Planning's policies on Aboriginal self-determination and the Treaty process. Traditional Owners have managed water sustainably in Victoria for tens of thousands of years, and we want to bring our knowledge and skills to participate fully, as partners, in water resource management.

The way water is managed and used will not return to the ways of pre-colonial days. The Traditional Owners represented by the partnership recognise this, but seek an equal say in how water is managed on Country. This includes an equal say at legislative, policy, planning, implementation and practice levels. To participate at each of these levels requires acknowledgment of, and management towards, the recognition, preservation and promotion of culturally significant values.

Having an equal say on how water is managed on Country also requires adequate and continuing resourcing, so that Traditional Owner groups can work alongside legislators, policy makers and land managers to embed culturally appropriate objectives and outcomes in the management of Victoria's water.

We have a different view on our waterways through the management of water, based on the plants and animals that need it to survive, based around our heritage, that's part of our responsibility for caring for Country.

— Tim Paton, Gunaikurnai

Proposal 4-10:

- **It is proposed that new funding be allocated to employ Traditional Owner cultural water rangers, to care for Country on Native Title, Traditional Owner Settlement Agreement and Registered Aboriginal Party land.**

The Strategy will also include an implementation plan that sets out priority water-related actions for the next 10 years. This program of work provides an opportunity to not only establish long-term, meaningful partnerships between water authorities and Traditional Owners, but also to adequately resource Traditional Owners to undertake the necessary work of implementing the Strategy.

The Strategy should establish clear expectations that all water corporations and government agencies involved in managing water resources or monitoring the health of Country will enter partnership agreements with each Traditional Owner group on whose Country the agencies are working. These partnership agreements should include formal resourcing arrangements so that Traditional Owners can plan and manage the work in a sustainable and continuing way.

Proposal 4-11:

- **It is proposed that there will be further reform to the *Water Act 1989* to require the establishment and resourcing of Traditional Owner Partnership agreements between water corporations, catchment management authorities, and other government agencies involved in managing Country and Traditional Owners.**

There should be a clear expectation that government and its delivery partners agree upon arrangements with the Traditional Owners on whose lands they operate.

Proposal 4-12:

- **It is proposed that water corporations, waterway managers, government agencies and public land managers enter into specific partnership agreements with the Traditional Owners of the Country on which they operate. These partnerships will be developed and resourced in a holistic way with each Traditional Owner group, with new funding for implementation of Strategy actions on Country.**

  What this means: As more government agencies begin working with Traditional Owners, the responsibilities of and expectations on Traditional Owners have increased. Formalising these arrangements through partnership agreements with each Traditional Owner group ensures that Traditional Owners can adequately plan and resource the necessary work.

The current statements of obligations under the *Water Industry Act 1994* require water corporations and catchment management authorities only to *report* on their involvement with Traditional Owners.

Proposal 4-13:

- **It is proposed that the Department of Environment, Land, Water and Planning, together with the appropriate Traditional Owner groups, review all water corporation statements of obligation (under the Water Industry Regulatory Order) to ensure that they explicitly include requirements to resource Traditional Owner participation in water planning, management and monitoring work.**

  What this means: Water authorities are currently required to seek approval from the Essential Services *Commission* for their pricing proposals, which are tied to their formal obligations.

Ensuring that these obligations include the necessary resourcing of Traditional Owners will enable both water authorities and Traditional Owners to carry out this work in a sustainable way in the long term. However, in order to understand the resourcing needs of Traditional Owners, there must be an initial investment in each Traditional Owner community to map out objectives and associated costs. It is not possible, or appropriate, for water corporations to undertake this work. Traditional Owners must be empowered to undertake this work.

Image: Pelicans at the Mitchell River, Bairnsdale, Gunaikurnai Country

4.8 Water justice in the long term

The rivers that flow on Gunaikurnai Country, we believe belong to Gunaikurnai People, and we should then have a huge say in who gets what and how. We should be the first people invited to the table … We think that we can look after the rivers better. When you have a look at some of the rivers that have irrigation, it's all mud. It's full of carp. That's not what we're about. We used to be able to drink out of that, our people. We may never go back to that, but we just want a larger say in how things work on our Country. I don't know if we're taken seriously by governments, and we should be.

— Uncle Lloyd Hood, Gunaikurnai Land and Waters Aboriginal Corporation

We hope that the SWS can support a just reform agenda.

— Water Unit, Wurundjeri Woi-wurrung Cultural Heritage Aboriginal Corporation

All Country is connected

The Central and Gippsland Region Sustainable Water Strategy is a tremendous opportunity to transform the foundations of water resource management in a way that recognises Traditional Owner rights and interests in water. The combination of increasing Traditional Owner water rights and entitlements and meaningful and well-resourced partnership agreements between Traditional Owners and government agencies involved in water management and monitoring the health of Country will be a significant step towards self-determination and restorative justice.

However, the Strategy is also a forward-looking document, with a plan for the next 10 years of water management and a broader vision for the future. The Traditional Owner Partnership has developed a wide range of objectives to bring water justice in the long term, and to enable Traditional Owner decision-making and management of water on Country in the Central and Gippsland Region.

The final Strategy will include a cultural landscape approach to water decisions and measurement, including better integration between land and water policy and competing land uses. Management systems based on Western science typically deal with land and water in a fragmented way: separate efforts to preserve threatened or endangered species, and segmented management of land, water, and competing land uses. Traditional Owners consider that all Country is connected, and that water cannot be considered in isolation of the land around it — for example, an upper reach is connected to the lower wetlands and beyond.

Proposal 4-14:

- **It is proposed that waterways named in the final Strategy will include Traditional Owner names (as directed by each Traditional Owner group on a case-by-case basis).**

Place-based connected land and water management

Our involvement with the Wilip-gin Birrarung murron Act has raised expectations amongst our community about what is possible if we work together in partnership.

— Aunty Margaret Gardiner, Wurundjeri Woi-wurrung Elder

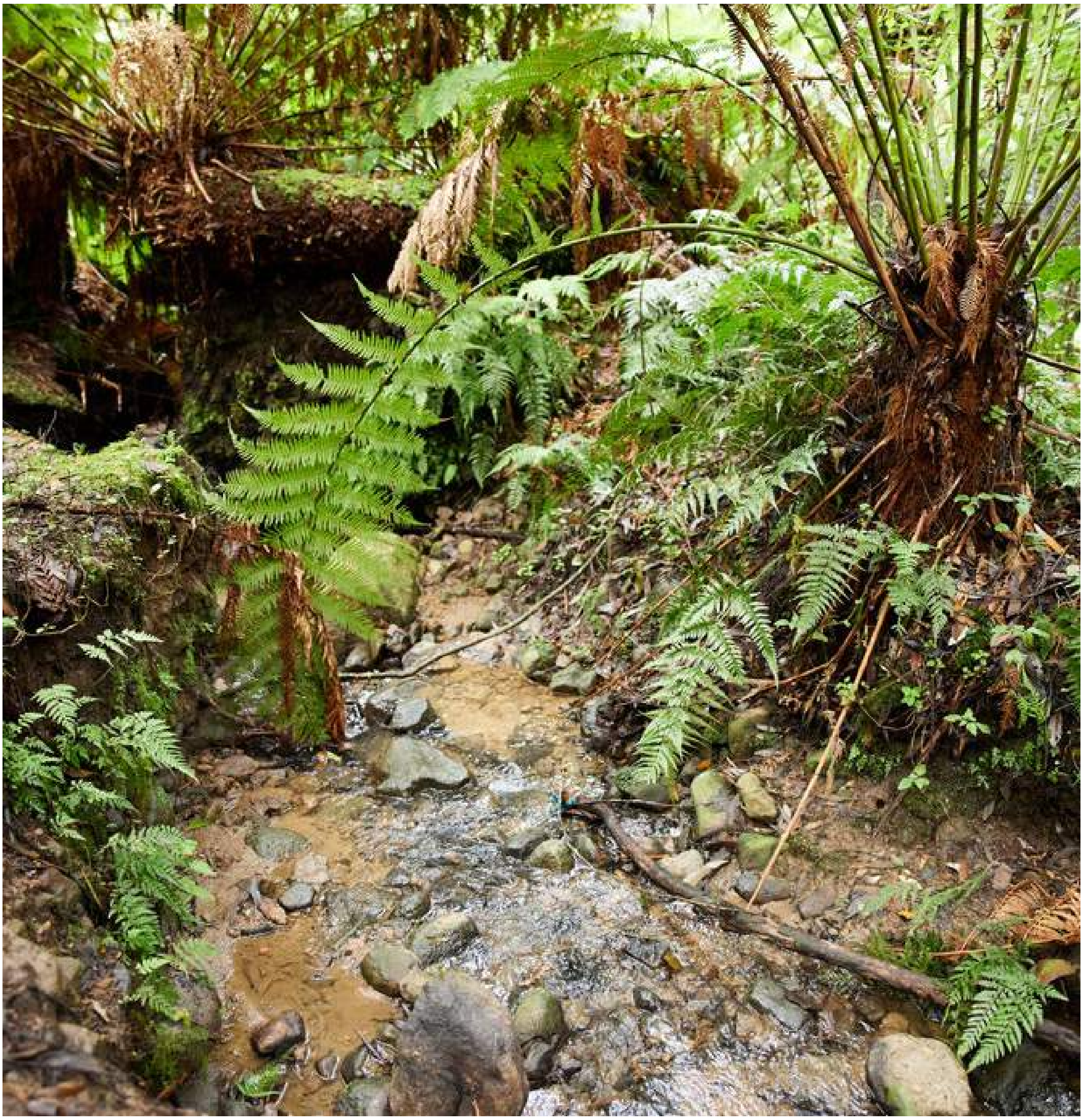
Victoria has two pieces of place-based legislation that specify Traditional Owners as rights holders (including preambles in many languages): the *Yarra River Protection (Wilip-gin Birrarung murron) Act 2017* and the *Great Ocean Road and Environs Protection Act 2020*. Both statutes establish the foundations for partnership arrangements with Traditional Owners in a modern collaborative governance model that is framed around the protection and management of revered, iconic landscapes, in a way that integrates the management of land and water.

The Traditional Owner Partnership considers that place-based legislation reflects the connection to Country of Traditional Owners, and the laws and cultural protocols of Traditional Owners, which have been developed over millennia of caring for Country. The partnership is not advocating for the exact replication of the two existing statutes, as each has strengths and weaknesses, but rather is emphasising that this model of legislating for connected land and water governance should be widely adopted within the Sustainable Water Strategy region and developed in partnership with each Traditional Owner on Country.

Proposal 4-15:

- **It is proposed that each Traditional Owner group be resourced to participate in the development of placed-based legislation, named in relevant place-based legislation, and resourced to undertake prescribed responsibilities.**

Image: Sassafras creek, Wurundjeri Woi-wurrung Country



5. How we use water efficiently

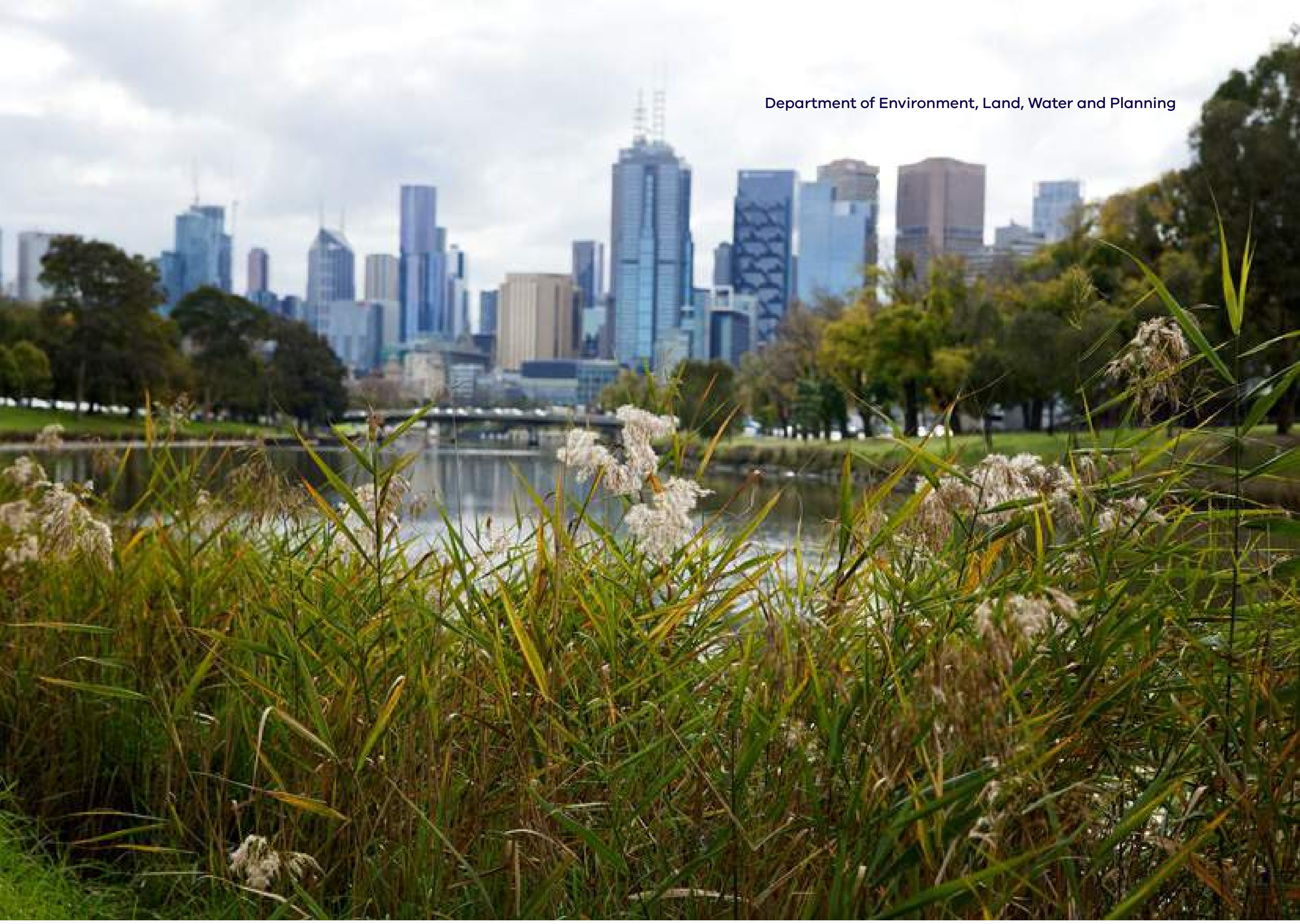


Image: Melbourne CBD over the Yarra River, Wurundjeri Woi-wurrung Country

At a glance

- Using water wisely and efficiently is the most cost-effective way to cope with growing pressure on our water supplies, although the potential yield of water savings is diminishing and alone will not meet our future water needs.
- Water efficiency measures can play an important role in reducing the growth in per capita demand for water. If Melbourne keeps below its maximum water-use target of 155 litres per person per day, we could reduce urban water consumption by about 4 gigalitres per year.
- Water efficiency is also one of the most cost-effective means of helping secure our water supply, and can help delay investment in infrastructure for new sources, thus reducing costs for customers.
- In cities and towns, water efficiency efforts will focus on education and behaviour change; use of rainwater tanks, stormwater and recycled water to meet non-potable demands; and incentives and regulations to improve the way we use every drop of water in our homes, businesses and industries.
- Water efficiency efforts in irrigation will continue to bring water savings and new efficiency measures through irrigation modernisation, as well as water quality improvement from sustainable irrigation practices.
- Water efficiency can benefit the environment, through operational arrangements such as using consumptive water en route, or combining environmental flow releases with natural high-flow events in rivers.

5.1 Achievements so far

In the home

Victorians have a strong track record of saving water. We made big changes to how we value, use, store and deliver water as a result of the Millennium Drought in the early 2000s. We continue to improve how we use and save water, not only in our cities and towns, but also in industry and agriculture, and in making the most efficient and effective use of environmental water.

Using all available water more efficiently is fundamental to making the most of a finite resource; building the resilience of cities, towns, farms and industries; and creating opportunities to return water to Traditional Owners. It is the most cost-effective way to help manage supply and demand. When planning for difficult conditions such as droughts and water shortages, our first goal is to reduce the amount of water lost or wasted, before taking other measures such as investing in new sources of manufactured water.

In cities and towns, Victorians have been consistently reducing their water consumption, achieving large declines during the Millennium Drought and maintaining them in recent years. This is the result of changes to people's behaviour, more efficient water appliances, and the changing character of Melbourne's suburbs (smaller blocks, fewer gardens and lawns, and higher density living).

Melbourne's residential water consumption has decreased by more than one-third in 20 years: from 245 litres per person per day in 2001 to 157 litres today (Melbourne Water et al., 2020). For 5 million people, that means we've saved around 150 gigalitres each year — the annual production capacity of the Victorian Desalination Project.

Residential water use outside Melbourne varies significantly, due to varying house-block sizes, demands and climate conditions across the different parts of the Central and Gippsland region. In 2004–05, domestic consumption ranged between 196 and 244 litres per person per day, and is now between 144 and 203 litres per person per day across regional areas. These figures are the result of impressive water savings in our regional cities and towns. For example, domestic demand in East Gippsland Water's region dropped by 22 per cent between 2004–05 and 2019–20, and Geelong uses less water today than in the early 1980s, despite doubling its population. Over recent years, however, per capita water savings have stabilised, meaning we need to find new ways to save water in our cities and towns.

On farms

In rural areas and major irrigation districts, water corporations and farmers are making improvements to the efficiency of both off-farm water-delivery infrastructure, such as channels and pipes, and on-farm irrigation practices. This maximises the quantity of food and fibre produced with the available water, and helps minimise off-site harm such as land salination and damage to waterways.

In rivers and waterways

Just like individual urban and rural water users, environmental water managers are finding many ways to manage water more efficiently and effectively. For example, timing of releases of water for the environment can be aligned to natural flow events or delivery of consumptive water, to achieve a greater environmental benefit (see **Section 8.9**). Water for the environment can also be used efficiently to benefit a number of sites from a single flow event, as the water moves from upstream to downstream. Infrastructure such as pumps, regulators and pipes can help move water to sites in the absence of natural floods, or reach a larger proportion of a floodplain with a smaller amount of water. Water management is also complemented by other environmental works, such as protecting drought refuges, improving habitat connectivity for fish, improving landholder management practices and strengthening integrated catchment management.

What we have heard so far

Feedback provided during early consultation for this Strategy showed support for:

- education to help the community understand that there is less water available and how they can reduce their own water use
- increased use of rainwater tanks — by making them mandatory in all new developments, providing subsidies and rebates, and through community education
- rebate programs to help households purchase water-saving devices and appliances
- water-efficient building standards for new homes
- changes to pricing to give users incentives to use water efficiently
- waterwise restrictions, such as those used during droughts, to prevent future shortages
- continued investment in provision of information, support and technology to improve efficiency on farms.

5.2 Opportunities for the future

It is important that all water users are as being efficient with their water – especially when one water source is shared by different users. For example, since irrigators and urban supplies often draw water from the same system, in times of shortage it is important that urban customers are not being inefficient with their water supplies if irrigators are put on restrictions or reduced allocations, and vice versa.

By using water more efficiently, we make the most of this valuable resource. Other benefits include reducing the amount of wastewater that needs to be treated and disposed of, lowering energy costs of hot water use, minimising harm such as nutrient run-off from inefficient farming practices, and boosting waterway health.

Using water more efficiently also leaves more water in storages, rivers and aquifers to support other uses and values. In some circumstances, specific water efficiency activities may bring water savings that could be made available to meet other demands, including environmental water needs or water for Traditional Owners. As part of this Strategy, such opportunities will be explored on a case-by-case basis in consultation with Traditional Owners and catchment management authorities.

The Victorian Government will continue to support the water sector, businesses, farmers and households to find new, innovative and cost-effective ways to use water more efficiently everywhere: in delivery networks, in our homes, on farms, in industry, and in the region's rivers, streams and wetlands. If we do this, we could save around 50 gigalitres per year, comprising:

- 4 gigalitres through stronger building controls (across Victoria)
- 10 gigalitres through a shower head exchange program (across Victoria)
- 8 gigalitres through a non-residential support program (across Victoria)
- 10 gigalitres through greater use of stormwater and recycled water for public open spaces (Melbourne only)
- 4.5 gigalitres from a program aiming at 10 per cent reduction in system leakage (across the Sustainable Water Strategy region)
- 13 gigalitres by reducing residential per capita consumption from 157 to 150 litres per day through behaviour-change campaigns (Melbourne only)
- 2.4 gigalitres by reducing residential per capita consumption from 188 to 181 litres per day through behaviour-change campaigns (regional cities and towns).

Efficiency is fundamental to water supply management, and efficiency efforts must continue in the future. However, efficiency alone cannot meet the long-term water challenge facing this region — the long-term challenge is too big and the water savings possible through efficiency activities are not enough. If we implement all the measures above we could save up to 50 gigalitres of water each year, but we know that Melbourne alone will require much more over the long term. We must continue efficiency activities to ensure that we are sustainable and that we properly value this finite resource, while also exploring and implementing actions that add to our water supplies (see **Chapters 6** and **7**). Efficiency efforts, and the water savings they bring, will influence the timing and size of any augmentation we may need to implement, to meet our growing water needs.

Proposed direction 5-1:

- **The Victorian Government proposes to promote and invest in efficiency measures across all water users as a foundational element of water management, to enable all water users to contribute to Victoria's water security efforts**

The following sections set out a plan to accelerate water efficiency activities, especially in towns, cities and the agricultural sector. Environmental water managers will continue to manage water for the environment efficiently and effectively, consistent with policies outlined in Water for Victoria, and will look for new opportunities through the renewal of the Victorian Waterway Management Strategy.

5.3 Water efficiency in our cities and towns

Victorians use less water per household than any other Australian state or territory (other than Tasmania, which, though having higher rainfall, uses the same amount per household) (DELWP, 2020c). During periods of drought, Victorians have embraced voluntary campaigns such as metropolitan Melbourne's Target 155, and the accompanying regional campaign, Target Your Water Use. Their efforts have resulted in significant water savings, equivalent to the annual capacity of the Victorian Desalination Project every year since 2001 (**Figure 5.1**).

However, public awareness of the importance of water efficiency has faded in the recent years as memory of the severity and consequences of the Millennium Drought is fading, and the pressures of other shortages such as electricity are becoming more acute in people's minds. Feedback from the community reveals strong support for water efficiency initiatives, but further education and support are needed. The stabilisation of per capita water use over recent years also shows the need to try something new to build on our achievements. Victorian water efficiency initiatives have resulted in significant water savings that benefit the entire community, as well as monetary savings for individual water users (**Figure 5.1**).

Image: Lady watering garden, Rural property, Erica, Gunaikurnai Country

WATER EFFICIENCY PROGRAM

Since 2001, Melburnians have reduced their use by 36%, down from 245 L/d to 157 L/d. For a population of five million, this saves 150 GL/yr, which is the capacity VDP.

TARGET 155

VICFACILITIES

- **30** DELWP
  12 water corp. sites
  10 council sites
- **9.9 ML*****
  saved since 2016
- **$267, 855 total*****

SWEP
SCHOOLS WATER EFFICIENCY PROGRAM

- **1,277** Schools
- **9.9 GL** saved**
- **$31.5 million****
  water and wastewater charges

COMMUNITY REBATE & HOUSING PROGRAMS

- **14,261** vulnerable hardship customers*
- **648** emergency and not-for-profit housing*
- **355 ML/year**
- **$1.4 million**/year
  In water and wastewater charges
- Social, health & wellbeing benefits

*since 2015/16, 13,613 vulnerable customers outside of emergency and not for profit housing.
**total since 2012.
*** In water and wastewater charges - DELWP sites.

Figure 5.1: Main components of the Victorian Government's current Water Efficiency Program

Melbourne's population is forecast to rise from 5 million to 9 million by 2056, with regional towns such as Greater Geelong and Ballarat following a similar trend (DELWP, 2019a). The Central and Gippsland Region includes a range of small towns and regional centres whose populations are growing, including coastal towns that experience high demands during holiday and summer months.

This significant growth provides a unique opportunity to build in smarter water services, such as water efficiency measures and access to rainwater, recycled water and stormwater in new and redeveloped precincts. It costs much less to build water efficiency into new buildings than to retrofit existing buildings, so putting policies in place now for water-smart buildings, before significant population growth occurs, is an important and pressing opportunity.

In cities and towns, water use is not limited to households; nearly 30 per cent of water in urban areas is used for industrial and commercial purposes. In places like the Latrobe Valley in Gippsland, non-residential use can make up 81 per cent (28.5 gigalitres per year) of the total demand from Gippsland Water's urban supply system. Losses in the distribution system, referred to as non-revenue water, account for approximately 8 per cent (46 gigalitres) of total urban water across the region (**Figure 5.2**). This compares favourably with other local and international systems, but may still offer potential for water savings.

Better information and standards for appliances

Water efficiency labels for fixtures and appliances are set nationally, through the Water Efficiency Labelling and Standards scheme, and help consumers make decisions about water-using products at home and at work. While most appliances and fixtures display water efficiency rating labels, or provide this information online, only washing machines and toilets have associated minimum water efficiency standards that must be met at point of sale or installation.

Applying minimum standards to other appliances would stop the sale of inefficient appliances in Australia. New homes and businesses would be fitted with water-efficient appliances, and old appliances would be replaced over time with more efficient models. In the longer term, this would encourage innovation and reduce the cost of the more efficient products (by increasing their sales and range), while phasing out inefficient products. A five-year national review of the Water Efficiency Labelling and Standards scheme will be completed by the end of 2021.

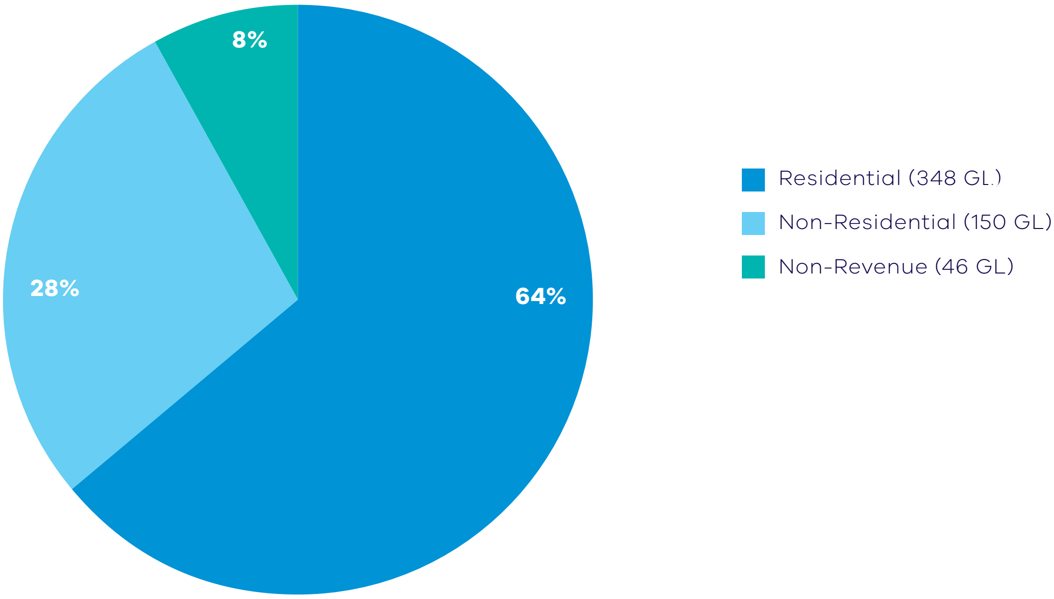


Figure 5.2: Breakdown of total water demand within cities and towns across the Central and Gippsland Region 2019-2020 (where the majority of non-revenue water is system leakage)

Proposed direction 5-2:

- **The Victorian Government proposes to work with the Commonwealth and the other states and territories to strengthen Water Efficiency Labelling and Standards ratings and minimum standards as part of the current review.**

New homes and renovations

Residential water use accounts for about two-thirds of the total urban demand in the region. While around 70 to 80 per cent of residential water use is indoors, this percentage is likely to increase as gardens become smaller and more people live in apartments. Significant advances in water-efficient shower heads, toilets, taps and other appliances are helping people save water and money. New, efficient shower heads also save energy, by reducing water heating costs, without people having to forgo a comfortable shower (Sustainability Victoria 2021).

New building controls could require all residential developments and renovations to incorporate fixtures and appliances that are more water efficient. The Victorian Government is evaluating the costs and benefits of introducing new minimum water efficiency standards for fixtures and appliances (such as taps and dishwashers) and raising existing minimum standards (such as shower heads and washing machines) in building and plumbing controls, through a regulatory impact statement. The benefits of expanding the use of rainwater tanks at home for non-drinking purposes is also being explored (see discussion of rainwater tanks below).

Changes to the Water Efficiency Labelling and Standards scheme minimum standards have a broader effect than changes to building controls, because they ensure that inefficient fixtures and appliances cannot be purchased in Australian stores, thus improving the efficiency of both new and existing buildings, and phasing out less efficient products. However, there may be some unique situations in existing developments where less efficient products are needed for technical reasons (such as showers in homes connected to old, very low pressure water distribution systems). For these reasons it might be necessary, for some appliances, to have lower national minimum water efficiency standards than those set for new buildings (where conditions such as pressure are easier to control). Changes to the Water Efficiency Labelling and Standards scheme must be agreed with the other scheme member states, and can take time.

Changing Victoria's building and plumbing controls to reflect advances in technology and the ever-diminishing (in many cases now non-existent) cost premiums of water-efficient appliances will help position Victoria as a leader in water efficiency, and demonstrate to the rest of Australia the benefits of more efficient fixtures and appliances.

Rental properties

Incentives for owners or renters to increase the water efficiency of rental properties are limited. Because renters pay for the water they use, there is little incentive for owners to replace fixtures and appliances (other than shower heads), especially for renters on short-term tenancies.

The Residential Tenancies Regulations 2021 introduced new energy efficiency minimum standards that require landlords to ensure, wherever possible, that shower heads are 3-star (or higher) at the time of entering into a new tenancy agreement with a renter. They also contain a longstanding requirement for rental providers to replace inefficient water-using fixtures and appliances with 3-star equivalents wherever possible. Water and energy bill savings could be achieved if these rules were strengthened, by requiring, for example, that when fixtures and appliances are replaced, at any time, they must be replaced with 4-star products.

Regulating for more efficient water fixtures and fittings will empower water customers to reduce their water use and manage their water bills. This is more and more important as the number of water customers who are financially vulnerable or experiencing hardship is increasing (ESC, 2020).

Rainwater tanks

Rainwater tanks can play an important role in reducing water demand. Their benefits include lower water bills, greener gardens and reduced stormwater run-off. To get the most out of tank water, and reduce demand for drinking water supplies, tanks should be plumbed into the house for uses such as flushing toilets, washing laundry and watering the garden. Regular maintenance is also needed for tanks to function correctly.

Image: Cattle on hill next to a water tank, Erica rural property, Gunaikurnai Country

Aquarevo

Aquarevo is a water- and energy-efficient residential estate being developed by South East Water and Villawood Properties. Located in Lyndhurst, 50 kilometres south-east of Melbourne, the estate will feature 460 water-sensitive homes that will reduce the community's reliance on drinking water by up to 70 per cent.

All homes will be plumbed with three sources of water: drinking water, recycled water and rainwater. Rainwater will be stored in a 2,400 litre tank, and filtered and treated for hot water use in the home for showers and laundry.

Properties will feature pressure sewer pods that will pump wastewater to a water recycling plant at the estate, where it will be treated and returned for use in gardens, toilets and washing machines. Smart technology will monitor and control the rainwater-to-hot-water system, and the pressure sewer, and record information about water and energy use. This helps the householder understand and adjust their usage and detect problems such as leaks.

Each rainwater tank will be connected to smart technology, developed by South East Water, that monitors water levels in the tank and can empty the tank via stormwater pipes ahead of predicted heavy rainfall. This can reduce local flooding by 25 per cent.

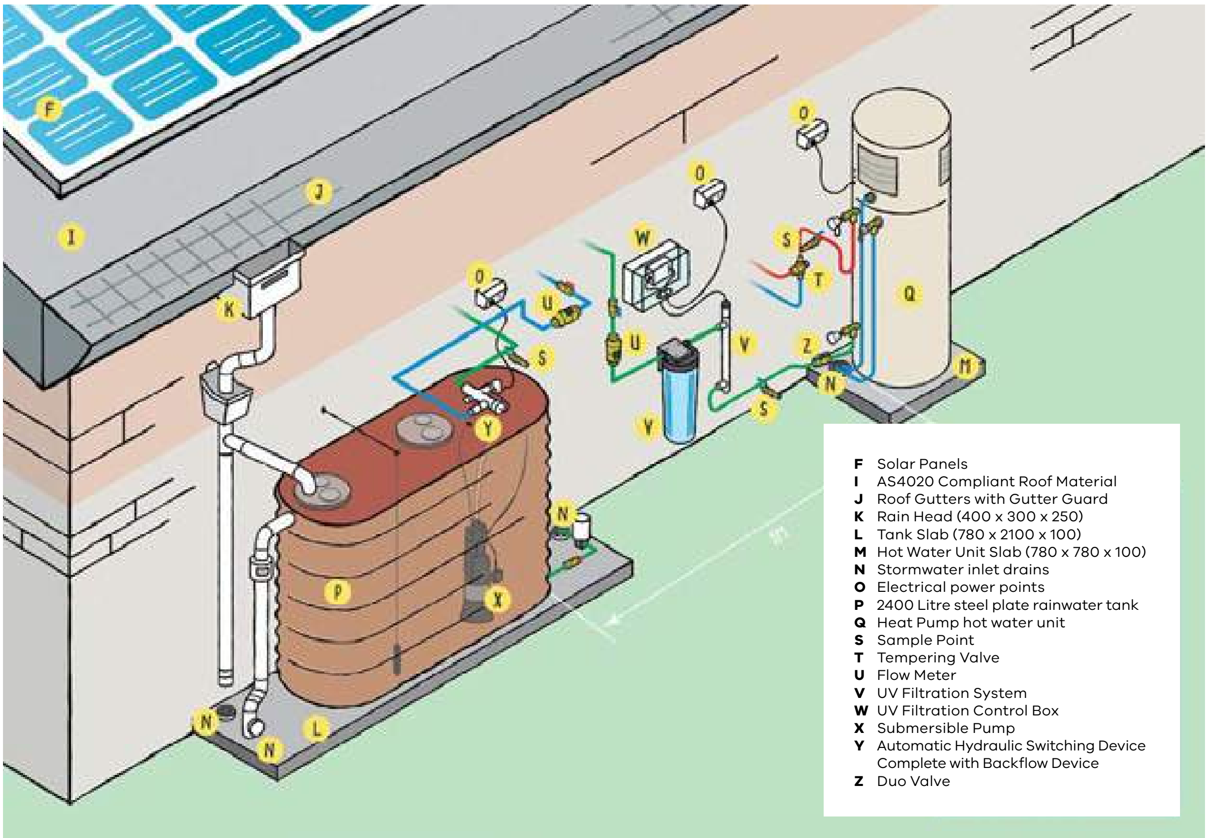


Figure 5.3: Components of the Aquarevo system (Cooperative Research Centre for Water Sensitive Cities, 2017)

Although individuals may install a rainwater tank as a personal choice, building regulations in Victoria (under the National Construction Code) promote the use of tanks by requiring all new freestanding homes and townhouses to install either a rainwater tank or a solar hot water system. To date, only one-third of new homes choose the rainwater tank option.

A review is under way to understand the costs and benefits of potentially requiring a broader range of developments to install rainwater tanks. Ways to improve the maintenance and functionality of tanks are also being assessed. The results of the cost–benefit analysis will support a regulatory impact statement. Extended requirements for rainwater tanks could be included in the 2022 National Construction Code, and in changes to local building and plumbing regulations.

There is a degree of uncertainty about the number of tanks in Victoria in operation. Some are installed but not connected to use in the house, others have been disconnected over time, and still more are poorly maintained. A CSIRO study of Melbourne tanks in 2015 found a range of installation and maintenance issues, with an overall tank failure rate of approximately 20 per cent (Moglia et al., 2015). To fully realise the benefits of rainwater tanks, we need mechanisms to ensure that tanks are maintained and operating as designed.

Proposed direction 5-3:

- **The Victorian Government proposes to inform future decisions, and prepare regulatory impact statements on the costs and benefits of:**
  - **introducing higher water efficiency requirements for homes**
  - **improving and extending the current rainwater tank requirement for new homes to a broader range of developments.**

Shower head replacement

Replacing inefficient shower heads is a cost-effective and simple way to reduce both water and energy use at home. Replacing a very inefficient shower head (1-star or 2-star) with a 4-star shower head can save a family of four around $315 per year in water bills, plus significant savings in energy. It is estimated that, across Victoria, up to 10 gigalitres of water per year could be saved via this program.

The Victorian Government offers discounts on 4-star water-efficient shower heads through the Victorian Energy Upgrades program,[11] which gives households and businesses access to discounted energy-efficient products and services. Opportunities to extend this program are being explored, for example by encouraging the installation of even more efficient shower heads, or combining the discount with other incentives, such as a free installation.

Proposed direction 5-4:

- **The Victorian Government proposes to develop a business case for statewide incentives for shower head replacements (such as free installation).**

11 See **www.energy.vic.gov.au/energy-efficiency/victorian-energy-upgrades.**

5.4 Changing people's behaviour

More than half of Melbourne's water customers, when surveyed in 2017, preferred to make changes at home than pay higher water bills. However, as the Millennium Drought recedes from memory, community awareness of the need for water efficiency is declining.[12] For example, the sale of the relatively inefficient 3-star washing machines has increased rather than decreased between 2014 and 2017 (Institute for Sustainable Futures, 2018).

To help Melburnians reach the target of a maximum 155 litres of domestic water use per person per day, the Make Every Drop Count campaign helped raise community understanding of water efficiency during the summer of 2019–20. Individual water corporations ran Target Your Water Use campaigns (the regional Target 155 counterpart) in regional areas.

There is merit in exploring opportunities to go beyond 155 litres by striving to meet even lower water-use targets, based on anticipated savings achievable through the programs identified in this chapter as well as expanded customer behaviour-change campaigns undertaken by individual water corporations. Targets that allow for geographical differences will be considered, and performance against targets could be published in water corporation annual reports. Such options should be explored as part of the Urban Water Strategies currently under development.

We now have an opportunity to refine behaviour-change programs to focus on those uses of water that will bring the greatest savings. Continuing and refining these programs into the future will help everyone understand why and how to save water. Such refinements could include examining how new technologies, such as apps and digital metering, can provide daily usage data to encourage behaviour change.

12 Based on a quantitative and qualitative research study commissioned by the metropolitan water corporations in late 2018.

Image: Rower on the Maribyrnong River, Footscray, Wurunderji Woi-wurrung Country

Birregurra Sustainable Communities

In Birregurra, a small town about 130 kilometres south-west of Melbourne, Barwon Water is collaborating with the local community, businesses, council and school leaders to encourage water-efficient behaviour, and detect and repair leaks. Barwon Water has installed 400 digital water meters in residences and businesses, monitoring hourly use.

Around 10 per cent of residential customers participated in a 12-week behaviour-change pilot project that used data from the digital meters. Those participating ended up using 27 per cent less water than other residential customers. Much of this success was attributed to making the project fun, encouraging competition between groups, and building on the strong local connections that regional communities enjoy. Participants could view their water-use data online through their own personalised dashboard, and received weekly reports.

The digital metering also helped identify 36 leaks at residential, business and agricultural properties.

So far, the overall Birregurra Sustainable Communities — Water project has saved approximately 11 megalitres of water, the equivalent of about six Olympic-sized swimming pools.

The program has really made me think about my water use. I have loved being part of the Water Savers and I have plans to put in more water tanks to reduce my outdoor water use.

— Debbie, Water Saver participant

Image: Members of the Birregurra Sustainable Communities – Water Community Working Group (from L to R): Birregurra resident Lachlan Gordon, Colac Otway Shire Councillor Chris Potter and Barwon Water General Manager Customers and Community, Jo Murdoch, with one of the town's 400 digital meters

Photographer: Josh Conn, Barwon Water Communications Adviser

Proposed direction 5-5:

- **Urban water corporations, in partnership with the Victorian Government, are proposing to implement an ambitious behaviour-change campaign across the region, using new technologies (such as apps and digital meters) and targeting customers and water uses likely to generate the greatest water savings.**

5.5 Schools, businesses and green open spaces

Although residential use of water is significant, non-residential customers account for 28 per cent of total water consumption in cities and towns across the Central and Gippsland Region. The water industry is keen to help these customers use water more efficiently and actively involve them in achieving long-term water security for the region. Non-residential water use includes all businesses, industries, councils, sporting clubs, community groups, not for profit organisations and any other landowners or managers that may use water from the potable/ reticulated water system.

Victoria's business and non-residential customers have shown that they can significantly reduce their water use during a shortage and help secure the state's water supplies. In Melbourne during the Millennium Drought, these customers collectively reduced their water consumption by almost 20 per cent (DELWP, 2020c).

Waterwise schools

Victorian schools in the Schools Water Efficiency Program are tracking their water use online and detecting leaks. A review of the program found that more than 28 per cent of the water used by schools is due to leaks and unnecessary usage. Since 2012, more than 1,268 Victorian schools (50 per cent of all Victorian schools) have signed up to the program, saving a total of 9 gigalitres. It also helps educate students on efficient water use.

To encourage more schools to be waterwise, the Schools Water Efficiency Program, or other similar digital metering and education programs, could be expanded to all government schools in the Central and Gippsland region by 2030.

Proposed direction 5-6:

- **Victoria will ensure that all government schools in the Central and Gippsland Region become waterwise, by participating in the Schools Water Efficiency Program (including use of school curriculum material) or other similar digital metering and education programs, by 2030**.

Support for businesses, industries and not for profit organisations

The results of non-residential water efficiency initiatives implemented during the Millennium Drought, and recent metropolitan water corporation analysis of non-residential water efficiency during the 2018 dry period, suggest that targeting significant high-use industries (such as hospitality) and specific end uses (such as cooling towers) could be extremely effective.

Non-residential water efficiency support programs could target specific non-residential sectors that share similar characteristics (for example, textile companies) or activities (such as use of woks, cooling towers or heavy use of hot water or steam). Benchmarking could also help businesses understand how wisely they are using water compared to other similar businesses. Group sessions, appliance exchanges and online tools and communications could be used to reach many businesses with minimal resources. Green financing and green leases (financial activities specifically created for a better environmental outcome) for non-residential water efficiency upgrades could also be promoted.

Water Management Action Plans can help businesses become more efficient water users. In 2007 and 2009, when such plans were mandatory for large water users, participating businesses reduced their usage by an average of 5–10 per cent, with some achieving up to 20–30 per cent (Gill *et al.*, 2007). Around 17 gigalitres was saved over this period. Water Management Action Plans help businesses find simple ways to reduce their water use — for example, by installing dual-flush toilets or connecting to recycled water, stormwater or rainwater tanks.

Digital meters help organisations monitor their water use more closely, and quickly identify and fix leaks, potentially saving large quantities of water and money. However, it is not yet cost-effective to install digital metering for all customers across the region. Urban water corporations will continue to install digital meters in areas where it is cost-effective to do so.

There is an opportunity to accelerate the introduction of digital meters to high water-using businesses (such as water-intensive industries) or where there is highly variable water use (or incidental water use such as in sporting clubs or community halls). With improved understanding of their water usage, businesses will be better placed to make decisions on taking action to reduce their overall use.

VicFacilities monitoring trial

Between October 2016 and June 2020, the VicFacilities monitoring trial — a modified version of the Schools Water Efficiency Program, designed for large water-using commercial properties, such as large irrigated public open spaces — monitored water, electricity and solar generation at 30 Victorian Government and 12 water corporation sites. The trial helped the government sites save more than 63.5 million litres of water and reduce water bills by $191,000.

The project's capacity to detect leaks was demonstrated when, on a very cold morning in June 2020, at the Victorian Government Bendigo office, water in the pipes froze and a fitting on the solar hot water system broke loose, spilling over 3,000 litres per hour. The office was alerted and, within two days, the leak was found and repaired. The leak could have gone unnoticed for many weeks had it not been for the VicFacilities monitoring and alert system.

Proposed direction 5-7:

- **Urban water corporations, with support from the Victorian Government, are proposing to implement a targeted non-residential water efficiency behaviour-change program, including exploring the merits of:**
  - **benchmarking water usage across businesses and industry**
  - **reintroducing Water Management Action Plans**
  - **providing incentives (such as rebates) for installing digital water meters to large water users located outside areas earmarked for digital metering programs or other water efficiency upgrades**
  - **a program to help businesses, not for profit organisations and Traditional Owner Corporations implement activities identified in Water Management Action Plans or to detect leaks (noting the need for public and private contributions).**

Unaccounted water- and leakage-reduction targets for water corporations

Reducing leaks across the water network can save large quantities of precious water and money. For example, Central Highlands Water reduced its non-revenue water (mainly through leakage) from as much as 20 per cent in the early 2000s to just 10–11 per cent in 2017, saving 1.3–1.5 gigalitres per year. While Australia has among the lowest levels of leakage in the world, 10 per cent of our drinking water is lost to leaks every day (WSAA, 2019). Emerging technologies are making leakage reduction less expensive.

When considering investment in leakage reduction, it is important to look beyond the costs and benefits to the water corporation, to the broader social and environmental costs and benefits. A number of water corporations, such as South East Water, are already doing this.

Water corporations may set individual targets for managing leaks and losses that take into account broader social and environmental costs and benefits. Progress against these targets will be reported alongside existing water corporation leakage data on the Essential Services Commission and Bureau of Meteorology websites.

Water corporations also monitor water loss that cannot be accounted for. This is not water that is lost due to system leakage, but that is taken without permission from water mains via public access points (such as fire hydrants).

Proposed direction 5-8:

- **Water corporations will set targets for managing distribution system leaks and losses, which take into account the broader social and environmental costs and benefits. Water corporations are proposing to set targets for managing distribution-system leaks and losses, which take into account the broader social and environmental costs and benefits.**

Proposed direction 5-9:

- **Water corporations are proposing to work with the Essential Services Commission, Bureau of Meteorology and Water Services Association of Australia to review annual leakage reporting, to increase transparency and benchmarking of leakage performance.**

Supporting the greening of public open spaces

High-quality urban greenery is important for liveability across the Central and Gippsland Region. Our sports fields, parks, gardens and tree-lined streets contribute to the identity and liveability of our cities and towns. They provide numerous benefits, such as building resilience to droughts, extreme heat and floods; improving people's health and wellbeing; and providing ecosystem services (Roaf et al., 2010, Brugmann, 2012). Urban greenery helps to cool places and buildings, treat stormwater and improve air quality. It also leads to lower energy use and greenhouse gas emissions through, for example, reduced use of air conditioners (Nowak et al., 2002).

Under a hotter and drier climate, and as private gardens get smaller and more people live in apartments, there will be an even greater demand for quality green spaces and waterways in urban areas.

Urban expansion will result in new public and private open spaces and new street trees. At the same time, a drier climate, with increased evaporation, will reduce soil moisture. The mapping of useful life expectancy of trees, undertaken by the City of Melbourne for the Central City Urban Forest Precinct Plan 2012–2032, indicates that about 23 per cent of the City of Melbourne's trees will die by 2024, and 39% by the end of 2034, due to the irreversible damage caused by the Millennium Drought, and associated water restrictions. These impacts amplified the existing age-related decline of many significant elms and other trees.

Ways to use more stormwater or recycled water for irrigating urban greenery across the region are being explored through the state's integrated water management program, but such steps are not as straightforward as they sound. It can bring many benefits, but it can be costly to build the new infrastructure needed to capture, treat, distribute and store stormwater, recycled water or rainwater. For irrigating urban greenery we could focus on using stormwater, which is being produced at volumes up to 16 times higher from urban developments than natural sites. This would not only prevent the unnecessary use of potable water but would prevent stormwater produced in urban areas from ending up in local waterways, where it causes environmental damage.

Western Park stormwater harvesting project

Through a partnership between Baw Baw Council, Gippsland Water and the Victorian Government, facilitated through the Gippsland Integrated Water Management Forum, an existing wetland, located near the Western Park ovals in Warragul, will be modified for stormwater harvesting and treatment to irrigate nearby sports fields. A new storage tank will supply 20 megalitres per year of treated stormwater to irrigate the sporting grounds. Thus, less potable water will be used, and stormwater discharges to the Hazel Creek will be reduced. The project is expected to be completed by the end of 2021.

Finding sustainable and efficient irrigation solutions for open spaces is an important part of managing our long-term water needs.

In many cases, the amount of water needed for healthy open spaces is more than that provided through rain and sub-surface soil moisture, making irrigation necessary (Wasko & Nathan, 2019). Also, evidence suggests that providing additional water beyond that required to make plants healthy brings greater cooling benefits, which could become more important as our climate gets hotter (Coutts & Harris, 2013). **Figure 5.4** illustrates the potential benefits of providing more water for irrigation of green public spaces.

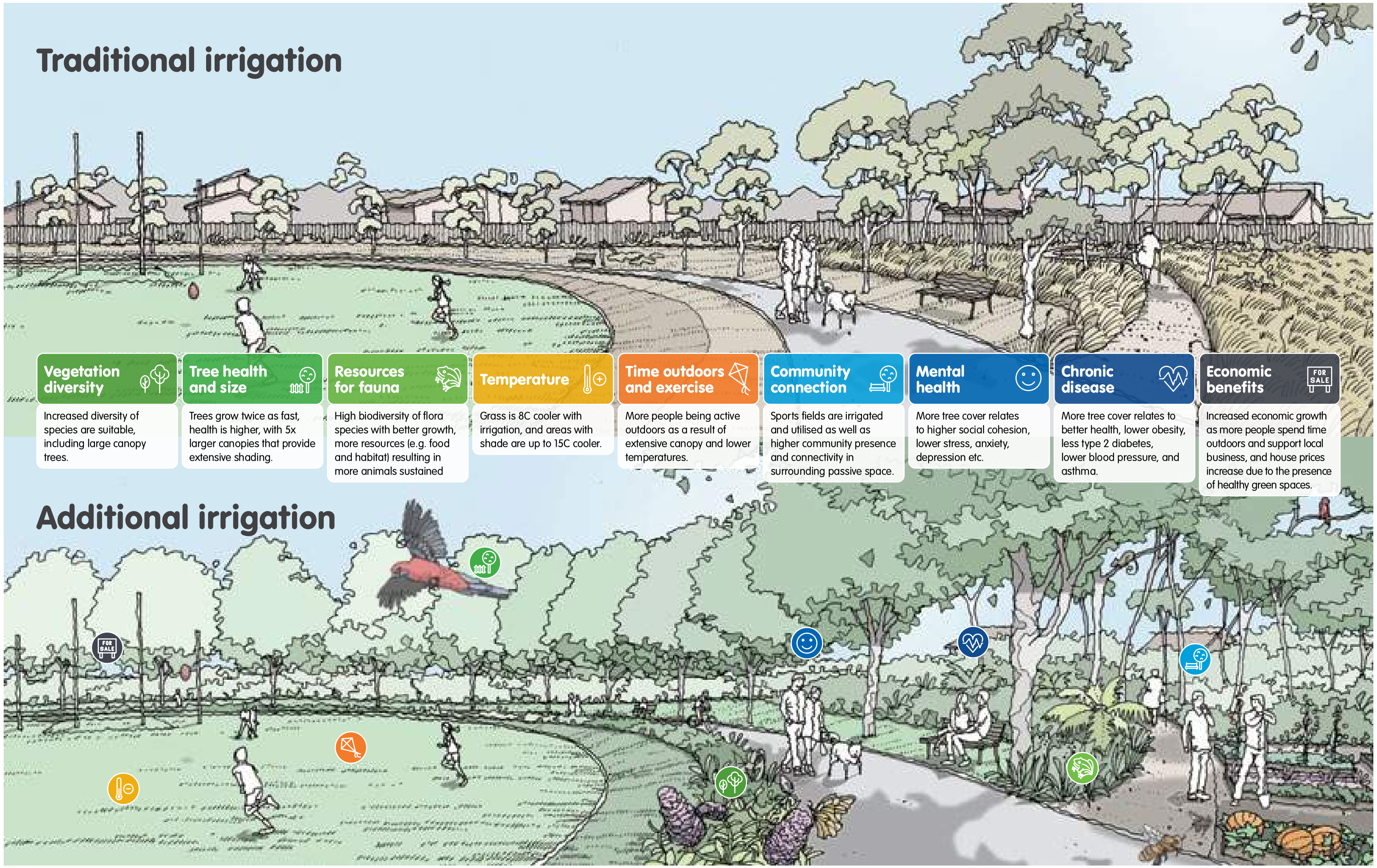


Figure 5.4: Benefits of irrigating more at 2070 (under high climate change scenario) (Melbourne Water, 2021b)

Image: Buckley Falls, Highton, Geelong, Wadawurrung Country

Studies show that the amount of water required to irrigate Melbourne's open spaces could more than double by the year 2050, increasing by 16 gigalitres per year (Melbourne Water, 2021b). However, Melbourne Water predicts that at least 40 per cent of this demand could be met by stormwater and recycled water.

In locations where it is not practical to irrigate with stormwater or recycled water, efficient irrigation will be paramount. Efficient water practices are about not just using less water, but also getting greater value from the water that we do use, in terms of the areas maintained, the services provided and the benefits for green spaces. Efficiency can be achieved through strategies such as planting species with lower water demands, monitoring soil moisture and creating smarter irrigation systems.

Proposed direction 5-10:

- **The Victorian Government proposes to provide incentives such as co-investing with councils, businesses, not for profit organisations and Traditional Owner corporations to use stormwater and recycled water to irrigate open spaces.**

Proposed direction 5-11:

- **The Victorian Government proposes to provide one-off grants to complete water efficiency audits for sporting grounds to identify and map opportunities to reduce, or substitute, demands on the potable water system.**

Chapter 7 provides more information on how stormwater and recycled water use for all potential water users will be facilitated and the role of Integrated Water Management to ensure the use of all sources of water is considered early in the planning of new developments.

5.6 Efficiency in agriculture

Water is essential for all agricultural production in the region — and across Victoria. It supports intensive production of crops and pastures on irrigated farms, and on dryland farms it is vital for domestic and stock needs.

With rising temperatures and declining water availability, agricultural producers in the region are already keenly feeling the need to make the most of available water. Continued improvement in water-use efficiency can support growth in the value of agriculture, even with less water being available in the future.

More efficient use of water in off-farm delivery infrastructure means that more of the water that flows into storages can be used on paddocks, while best-practice irrigation on farms means lower input costs, better yields, and less water draining off farms and carrying nutrients into waterways or groundwater.

Across the region, farmers are recognising the benefits of being more efficient and investing in best-practice irrigation on their farms. This is particularly important in areas — such as irrigation districts — where the majority of water going to crops comes from irrigation. The other benefits of on-farm efficiency improvement, such as yield improvement, crop flexibility and labour savings, also lead to adoption of more efficient methods.

Investing in off-farm water infrastructure

Significant upgrades of off-farm infrastructure are already being undertaken, and there are further opportunities to modernise rural water infrastructure. This can bring many significant public and private benefits, including water-use efficiency, improved access to water for agriculture, water savings for agricultural or other uses, unlocking on-farm investment to increase productivity, regional economic stimulus, greater farmer wellbeing, and environmental improvement by reducing discharge to local waterways and minimising seepage.

Southern Rural Water, businesses and the Victorian Government have developed and implemented projects according to the clearly stated principles for investing public funds in rural water infrastructure projects: long-term viability, net public benefit and value for money (DELWP, 2016).

In recent years, the government has worked with water corporations, businesses and the Commonwealth Government to make major upgrades to rural water infrastructure in the Central and Gippsland Region. Through modernisation of the Bacchus Marsh, Werribee and Macalister irrigation districts, more water is being made available for farming while other benefits are also realised, including improved level of service for water delivery, reduced system operating costs and lower on-farm labour requirements.

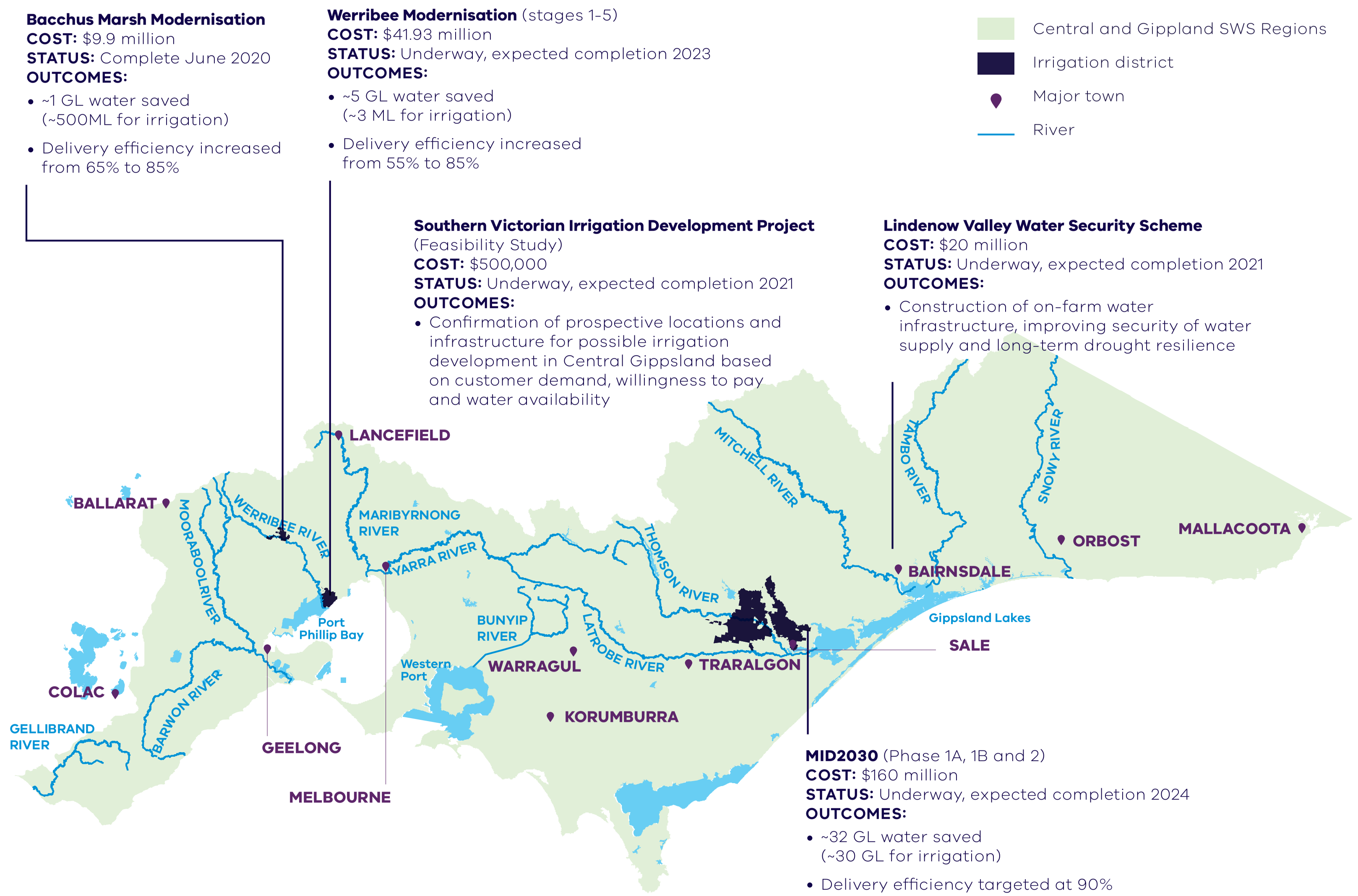


Figure 5.5: Recent investment in major irrigation projects in the Central and Gippsland Region

In the Central and Gippsland Region there are opportunities to further modernise rural water infrastructure to bring numerous benefits, including further investigations into delivering more efficiencies in the Macalister Irrigation District.

Investment in rural water infrastructure is guided by investment principles set out in Water for Victoria. Additional guidance to complement these principles is under development. This will increase the likelihood of successful funding through appropriate co-contributions, and also support the development and assessment of proposals to maximise public benefits from rural water infrastructure projects.

This extra guidance will also help identify opportunities for shared benefits, including the early consideration of possible benefits to Traditional Owners when developing and designing projects. Future opportunities to invest in irrigation programs will need to be consistent with the Water for Victoria guidelines and the proposed direction on investment in water infrastructure as set out in **Chapter 9** of this Strategy.

Irrigation district modernisation

The Macalister Irrigation District (MID) is the largest irrigation area in southern Victoria, with water supplied to farms via a network of storages, channels, pipes and regulators that were constructed more than 60 years ago.

Southern Rural Water has completed works under Phases 1A and 1B of the MID2030 strategy to overhaul the district's irrigation supply infrastructure. Works are continuing under Phase 2. By remediating channels, pipelining water supplies and introducing channel automation, water-delivery efficiency is improving from less than 60 per cent in 2004 to more than 80 per cent.

This project is already resulting in more water for farming, with a total of around 30 gigalitres of additional water to be made available for irrigation through savings. The Victorian Government's investment in Phase 2 is also recovering 1.7 gigalitres for environmental flows in the Macalister River, to be delivered in 2024.

The Victorian Government has also secured Commonwealth funding in 2021 to complete modernisation works in the Werribee Irrigation District. With large areas of the district already modernised, the $22 million Werribee Irrigation District Modernisation Project (Stages 4 and 5) will complete the replacement of a manual, inefficient, channel-based irrigation network with a modern, automated pipeline, thereby increasing water-delivery efficiency from 55 to 85 per cent.

Stages 4 and 5 are co-funded by local irrigators and will capture a further 1,350 megalitres of water savings per year. This will strengthen irrigation supply reliability and the resilience of local horticultural businesses in a changing climate. The first three stages of the project were completed at the end of 2019 with a $20 million investment jointly funded by the Victorian Government and Southern Rural Water customers.

Improving on-farm water efficiency and encouraging best-practice irrigation

There is a legacy of investment by irrigators and government in on-farm water-use efficiency, with widespread uptake of advice, extension and incentives through the Sustainable Irrigation Program. This program is a partnership between the Department of Environment, Land, Water and Planning, Agriculture Victoria, Catchment Management Authorities, water corporations and communities. It helps irrigators adopt best-practice management and improve their water-use efficiency through agricultural extension services, whole-of-farm planning, and incentives for on-farm improvements that have a public benefit.

The Victorian Government's Sustainable Irrigation Program has been helping farmers get the most out of their water for more than 30 years, as well as reducing harm to the environment and disadvantage to other users in major irrigation areas. With the implementation of land and water management plans, the Sustainable Irrigation Program provides extension support and information to farmers, and funds targeted incentives to achieve the public benefits of on-farm changes.

Through the Sustainable Irrigation Program, the Victorian Government is continuing to target investment and support for better management of land and water, and build the resilience of the irrigation sector. In southern Victoria, the program is focused on the Lake Wellington catchment, to minimise potential harm to the Gippsland Lakes from the intensive irrigation in the Macalister Irrigation District and surrounds.

The Victorian Government will continue to seek opportunities to integrate the Sustainable Irrigation Program, with major changes to infrastructure networks to maximise the public benefits of investment.

Image: Irrigation dams, Sale, Gunaikurnai Country

Newry Farm Planning Project

The Victorian Government's investment in sustainable irrigation seeks the greatest possible public benefit from funding, by saving water and reducing third-party impacts of irrigation.

As part of delivering Phase 2 of MID2030, the West Gippsland Catchment Management Authority and Southern Rural Water are implementing the Newry Farm Planning Project, providing whole-of-farm planning extension and incentives to 100 per cent of farms that are being upgraded to a piped water-supply system.

This means helping 32 irrigation businesses, covering 2,600 hectares, to implement best-practice irrigation at a landscape scale and maximise the benefits to their business of off-farm improvements.

The Victorian Government will keep working with communities, catchment management authorities and water corporations to take up these opportunities in the future.

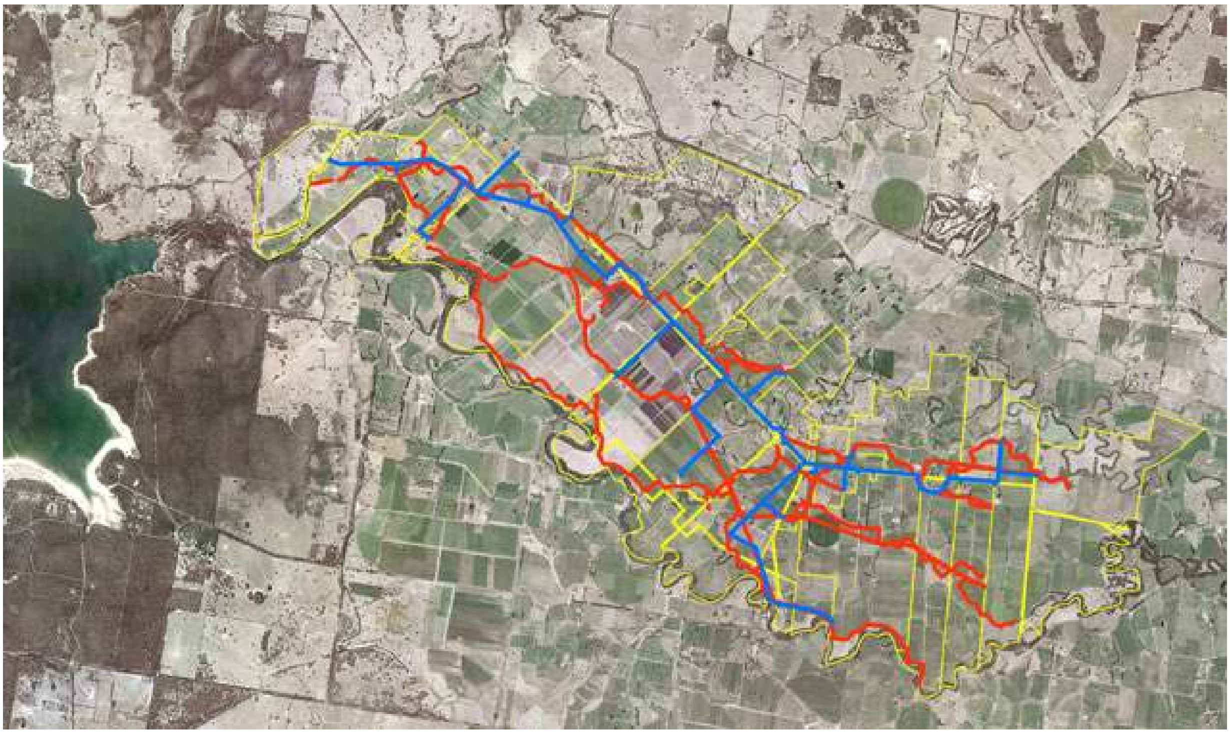


Figure 5.6: Map of the Newry Farm Planning Project (WGCMA, 2020)

The Victorian Government will continue to seek opportunities to integrate the Sustainable Irrigation Program with major changes to infrastructure networks to maximise the public benefits of investment.

As water availability changes across the region, local water demands and production systems for agriculture are also changing, and people are wanting to maximise the production of high-value crops in those areas that enjoy reliable access to water.

A coordinated program of land- and water-use mapping is being developed to give farmers, industries and government a good understanding of how agriculture in Victoria is changing, and of emerging trends in water use. This information will support the implementation of updated Irrigation Development Guidelines to ensure that any new, changed or redeveloped irrigation farms install efficient and effective systems that maximise water-use efficiency and minimise harm to the environment and third parties.

Proposed direction 5-12:

- **The Victorian Government proposes to support continued improvements in agricultural water-use efficiency and best-practice land and water management.**

This could be achieved through a combination of:

- helping irrigators continue to use water wisely, with targeted extension and support for on-farm changes and more information on making the most of their water
- helping water corporations and businesses recognise and take up opportunities for improvements in rural water infrastructure that can save water and achieve many benefits.

Image: Horse trotting beside a dam, Ealine rural property, Wadawurrung Country

Image: Domestic and stock dam, Elaine rural property, Wadawurrung Country

6. How we grow our water supplies

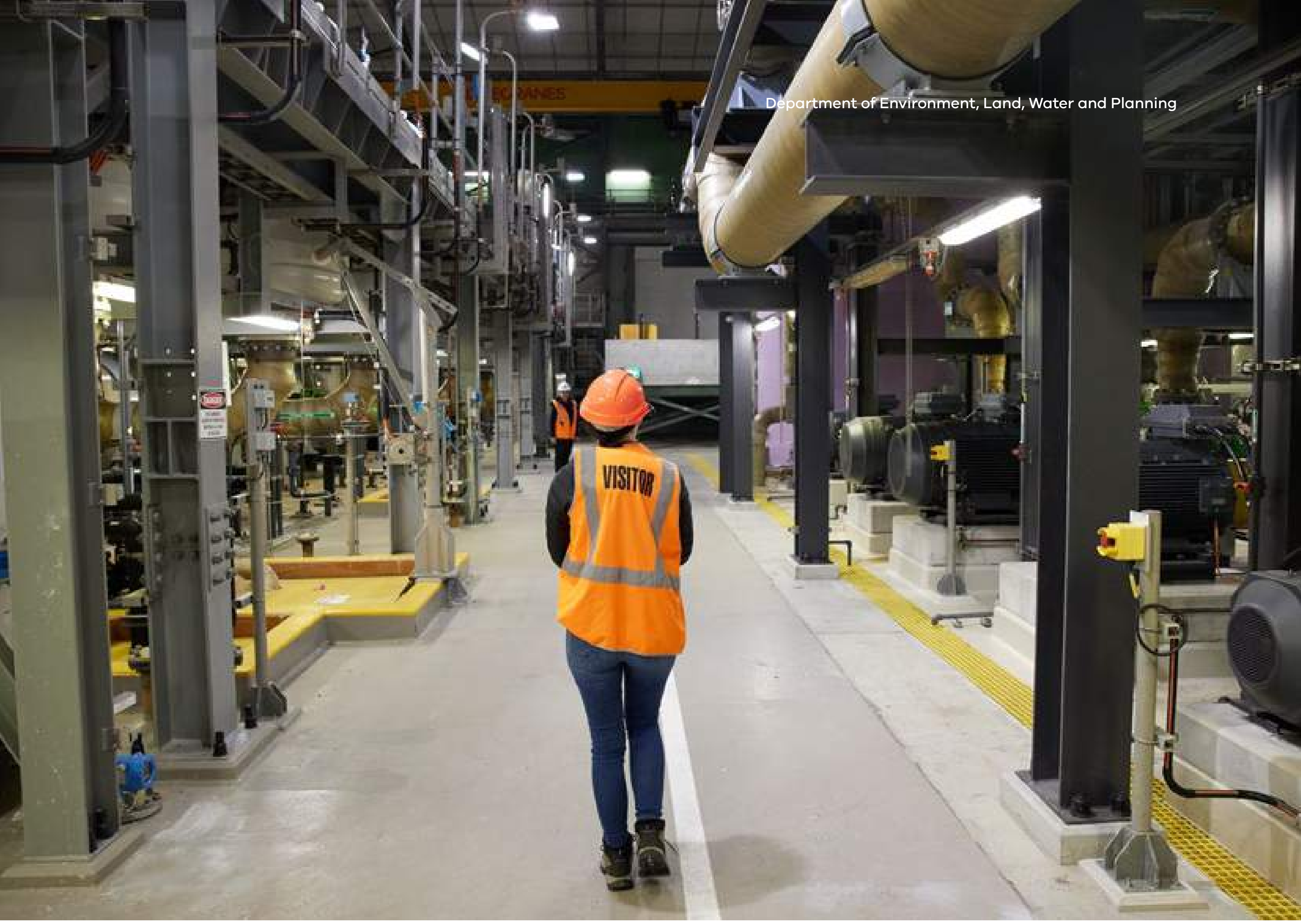


Image: Worker at the Victorian Desalination Project, Wonthaggi, Bunurong Country

At a glance

- Over the next 50 years, the Central and Gippsland Region will make the transition to using more manufactured water (desalinated and fit-for-purpose recycled water) and stormwater to meet most of its urban water needs.
- By 2040, manufactured water is expected to provide more than 50 per cent of the total water used in Greater Melbourne, and towns and industries connected to the water grid (up from 35 per cent in 2020). This could increase to around 75 per cent by 2065.
- A Water Supply Readiness Roadmap will guide incremental investments in new, climate-resilient water supplies, when we need them.
- Investments will balance water security with bill affordability, and respond to the need to reduce reliance on river water for urban supply, mitigate harm from stormwater to urban waterways, and return water to Traditional Owners.

What we have heard so far

Feedback provided during early consultation showed support for:

- a holistic approach to water management and long-term planning
- reducing reliance on rivers to supply water for cities and towns by increasingly investing in manufactured sources of water (69 per cent of responses to the online survey were very supportive)
- use of different water sources, including desalinated water and recycled water, provided they are built and run with a low carbon footprint and renewable energy
- sustainable management of aquifers through cautious management, monitoring and regulation
- storing water from floods, and using aquifers as storage
- continuing efforts to involve the community, keep in touch with community needs and values, and raise public awareness of problems and opportunities
- better collaboration between governing bodies.

6.1 The transition to using more manufactured water supplies

Population growth, longer drier periods, and more frequent and severe bushfires are depleting the water in our rivers and dams. Although becoming more water efficient is the first step towards managing our water needs (see **Chapter 5**), new climate-resilient water supplies will be required to meet growing demand and avoid severe water restrictions. Building more dams is not a solution: in the longer term there will be less rain to fill them (see **Chapter 2**).

Over the next 50 years, the region will make the transition to using more manufactured water (desalinated and fit-for-purpose recycled water) and stormwater to meet most of its urban, irrigation and public open space needs. Desalinated water made up 25 per cent of the total urban water used across Greater Melbourne and connected towns in 2020. By 2040, more than half of the total water used in the Melbourne supply system is expected to be manufactured water, increasing to around 75 per cent by 2065. For regional towns on local supply systems, future demand will be met by using more recycled water and stormwater for non-drinking uses, to reduce our reliance on, and increase the resilience of, local supplies.

Future investments in manufactured water will balance water security with bill affordability, including support for vulnerable households. New water supplies will need to bring many benefits, including freeing up river water for the environment or returning water to Traditional Owners (see **Section 8.1**).

In line with the Victorian Government's commitment to net zero greenhouse gas emissions by 2050, new water supplies will need to use renewable energy, or offset the energy used. For example, the electricity used to operate the existing desalination plant at Wonthaggi is 100 per cent offset with renewable energy.

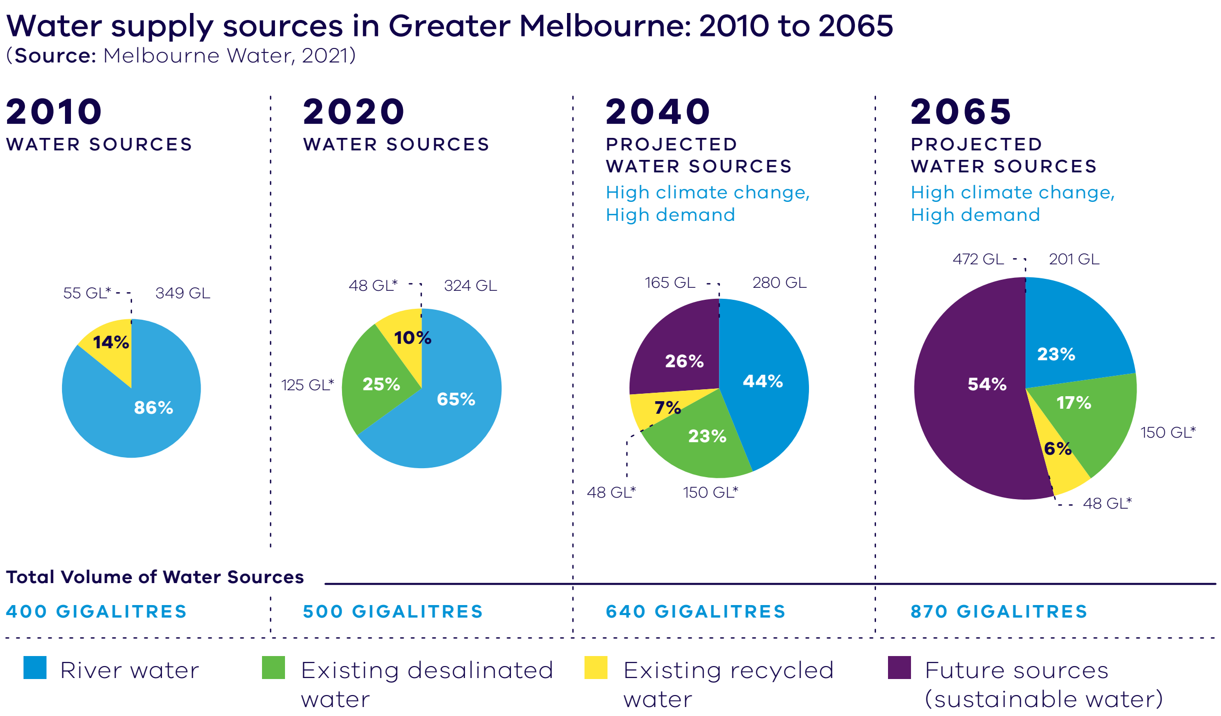


Figure 6.1: Expected transition from reliance on river water to more manufactured water for Greater Melbourne, 2010 to 2065 (prepared by Melbourne Water, 2021)

Image: Victorian Desalination Project, Wonthaggi, Bunurong Country

The transition to manufactured water in Perth

In Perth, water managers commenced a similar transition to manufactured water in the 1970s, due to a significant reduction in river supplies, which meant that their existing dams did not provide adequate water security. Perth initially moved from river water to groundwater, and more recently to desalinated water, which now makes up about 50 per cent of Perth's water supply, and in future will move to purified recycled water, via aquifer storage over 10 years, as shown in **Figure 6.2**.

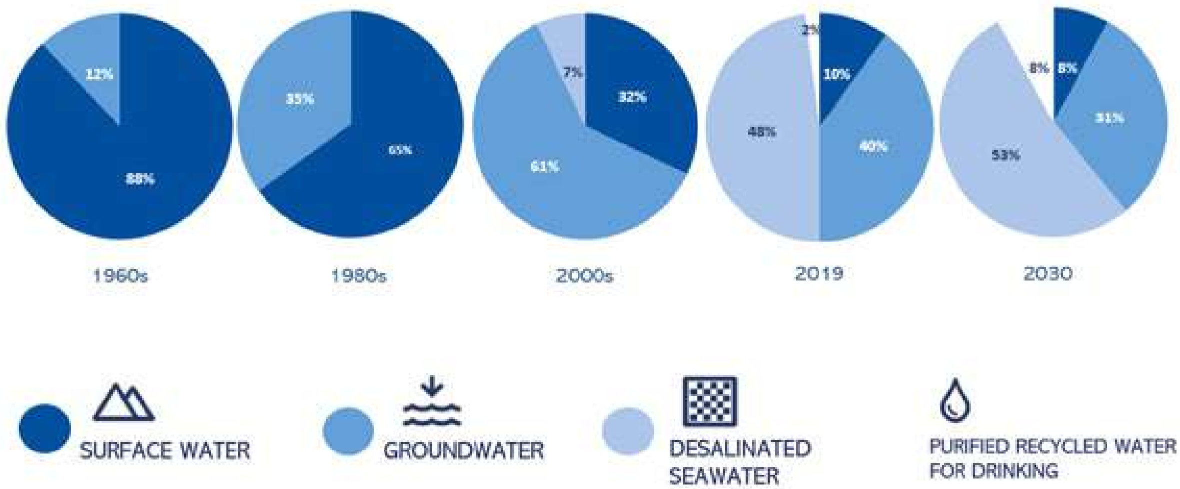


Figure 6.2: Water supply sources for Perth, 1960s–2030s (source: WSAA, 2020)

6.2 A new approach to delivering new water sources

In the past, any major addition to our water supplies — such as the Victorian Desalination Project — was a once-in-a-generation project, usually built in response to an acute shock such as a severe drought. Today, the best available evidence and water supply modelling predicts that we will need more frequent increases to our supplies, averaging about 50 gigalitres every five years, to meet the region's growing demand (see **Chapter 3**). This estimate already assumes that the current desalination plant is used every year to supplement the region's other water supplies, and not just as a backup during droughts (as was the case a decade ago). In practice, it may be more cost-effective or practical to build individual water supply facilities that are each smaller or larger than 50 gigalitres, provided there is a collective addition to overall supplies of about 50 gigalitres every five years.

Decisions to add new water supplies were in the past based on the needs of cities and towns. This Strategy is an opportunity to introduce an integrated approach that considers the needs of all water users and values when making decisions about new water supplies, and when deciding how we should share existing supplies (see **Chapter 8**).

To meet our future needs, a new and transparent planning approach is needed to proactively and incrementally grow our water supplies. To this end, the Victorian Government proposes to work with the water sector and Traditional Owners to develop a Water Supply Readiness Roadmap to test with the community and interested parties.

So that we can respond to variations in climate and rainfall, proposed new water supply projects need to be planned early, ready for construction as soon as they are needed. Several options should be investigated, and planning for preferred, near-term supply options put in train (**Figure 6.3**). Location, design, approvals, funding, cost–benefit analysis, contractual matters, operation and governance all require investigation and planning, so that feasible and preferred options are ready to proceed when they are needed, with shorter lead-times. The need to free up water in rivers for the environment and to return to Traditional Owners will also inform decisions about new supplies. Investing in studies in the short term will save public money in the long term and ensure that new water supplies can be added when they are needed.

Figure 6.3: Proposed process to investigate and advance identified options before selection, and implementation of preferred option

There is a need to revise the decision-making triggers for adding new water supplies, to better distinguish between acute (short-term) water needs (such as during extended droughts) and chronic (long-term) water needs that accumulate over time as a result of population growth and climate change. These triggers should consider all water sources in the region, along with all users and values, including Traditional Owners and the environment. Considering the full range of uses and values would allow, for example, new sources to be added sooner for cities and towns, to free up water that is critically needed in rivers for environmental health (see **Section 6.3**).

The Roadmap will articulate the triggers for:

- readiness — when planning processes for preferred options should commence
- selection and implementation — knowing when to implement new supplies in response to near-term shocks (such as reduced storage levels) and long-term trends (population growth and declines in average inflows).

Rethinking the investment triggers will reduce the likelihood of investing too late, which increases the risk of prolonged water restrictions, or too early, which can lead to an unnecessary cost burden for customers.

The Roadmap will be flexible and adaptable to changing water needs and climate conditions. It will allow options to be implemented early, delayed or updated, to reflect the best available data and modelling, drawing on information from and aligning with the Annual Water Outlooks and Urban Water Strategies.

The Roadmap will ensure that we build new, climate-resilient supplies as we need them, and smooth the costs of these investments over the next 50 years. The first Roadmap will be published in the final Strategy and regularly updated, for example at least every five years when Urban Water Strategies are prepared. This will ensure that it responds to changing conditions, new or better information, technological advances and evolving community preferences. It will be designed to ensure that a suite of possible options are in development, to be ready to implement as required, and that the best option is chosen for implementation at the right time.

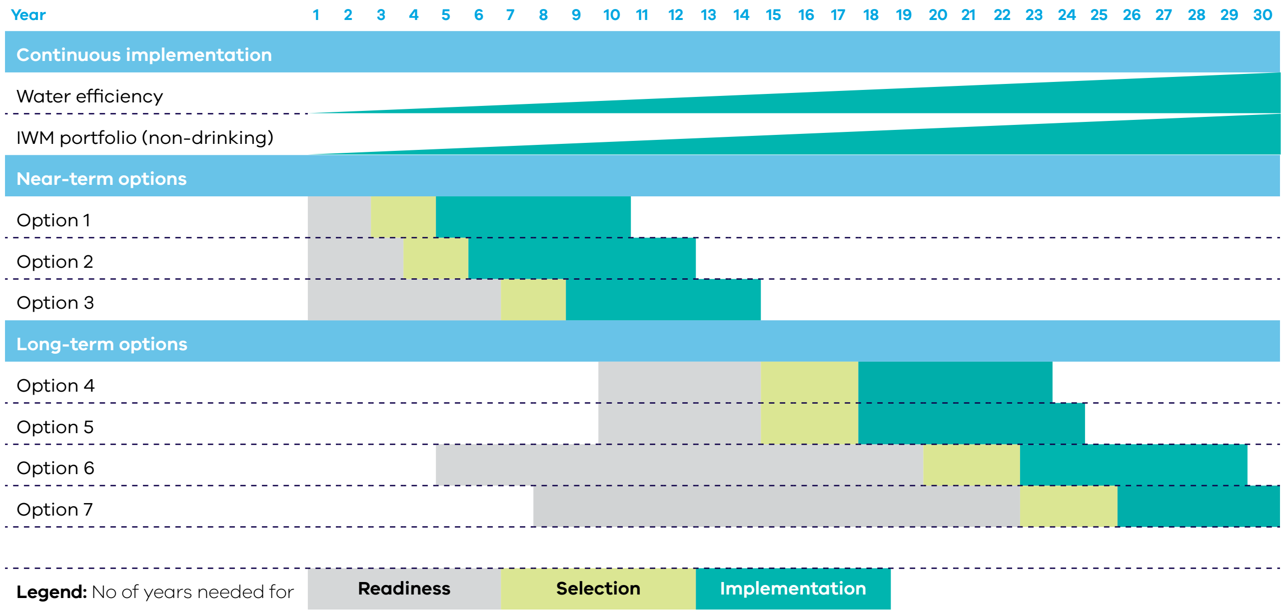


Figure 6.4: Indicative format of the Water Supply Readiness Roadmap overview

Proposed direction 6-1:

- The Victorian Government proposes to work with water corporations, catchment management authorities and Traditional Owners across the region to develop a Water Supply Readiness Roadmap (to be published in the final Strategy and regularly updated).
- The Roadmap will identify preferred near-term water supply options based on a quadruple-bottom-line analysis, clarify the roles and responsibilities of the various parties for decision-making and implementation, and articulate the triggers for readiness, selection and implementation.
- Assessing the potential of each option to return water to the environment and Traditional Owners will be an essential stage of the assessment process.

Image: Thomson reservoir dam wall

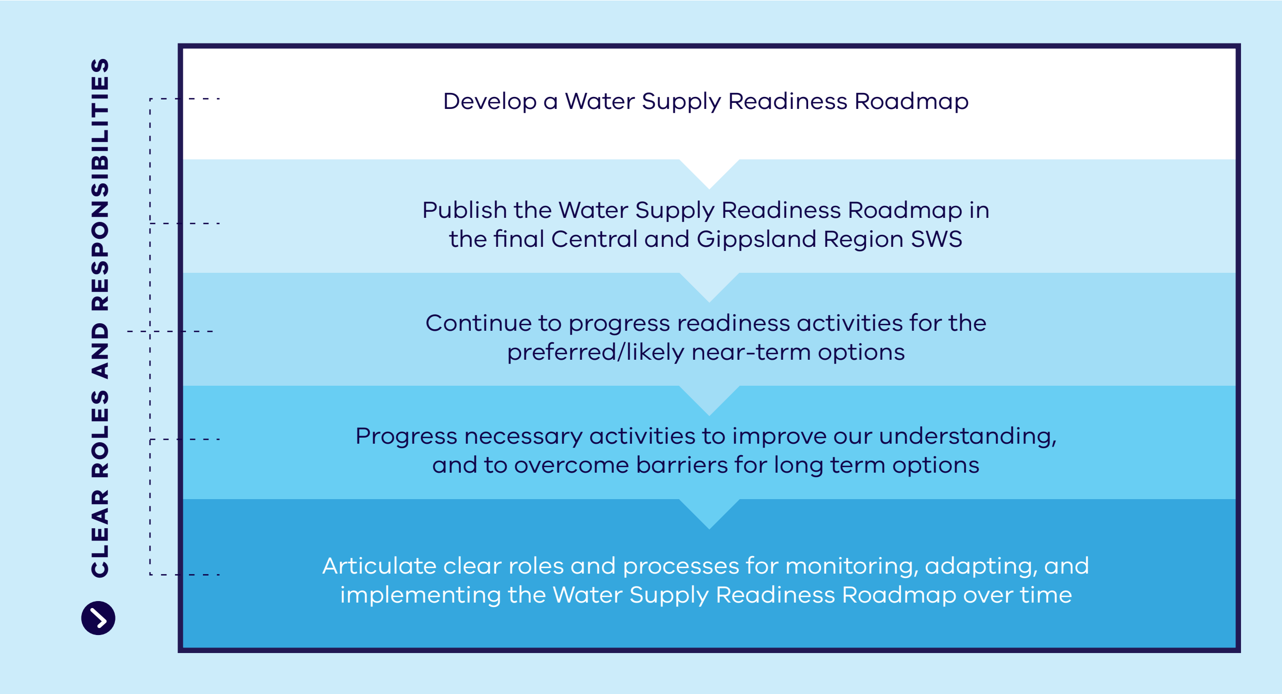


Figure 6.5: A new approach to water supply planning

6.3 How options for new sources of water will be identified and assessed

A combination of new water supply options is required to meet the future needs of all water users. Although large-scale extraction from rivers (including water stored in dams) and groundwater are currently the lowest cost option in dollar terms, this is not the case from a quadruple-bottom-line viewpoint. These water sources have created, and continue to generate, a serious legacy of cost to both environmental health and Traditional Owner values. There are no new large-scale opportunities to take water sustainably out of rivers or groundwater in the region. Indeed, the reliability of existing river supplies is projected to decline even further as the climate continues to dry. Therefore new supplies will need to come largely from manufactured sources: desalinated and recycled water in some locations, and stormwater.

Urban water corporations are responsible for identifying new sources of water and closely evaluating preferred options through their Urban Water Strategies. In developing their preferred options and service levels, urban water corporations respond to community feedback on preferences and willingness to pay.

The new Roadmap will build on this process by improving the way in which individual supply options are evaluated and prioritised. Each option will be assessed to determine whether it is feasible: can it be built to deliver the volume of water required, of the desired quality, for the desired end users? Feasible options are prioritised, according to a quadruple-bottom-line analysis, into a shortlist of preferred options to be included in the Roadmap. The quadruple-bottom-line analysis will include performance measures and evaluation for Traditional Owner cultural and spiritual benefits, as well as economic, social and environmental criteria.

Factors to be considered during this assessment could include:

- being fit for purpose — economically, environmentally, culturally (Traditional Owner) and socially (including affordability for households)
- resilience — how likely is it to perform under a range of climate scenarios or be disrupted by other events?
- community acceptance
- alignment with current policy and regulation
- potential consequences for the community and the environment
- lead-times
- volume supplied
- complexity of substitution arrangements (where applicable)
- opportunities to serve, and share the benefits with, many water users.

Options will be grouped into near-term preferred, long-term preferred and not preferred:

- *near-term option* — definitely feasible in the short term (now); merits the full suite of readiness activities so that it can be delivered when triggered (include in the Roadmap as a near-term option)
- *long-term option* — may be feasible in the long term (that is, about 20 years); cannot be committed to now, but merits further technical investigation and community consultation (note in the Roadmap as a possible long-term option)
- *unfeasible option* — not feasible now or in the future, due to a fatal flaw; little value in further analysis.

The rationale for these decisions will be communicated in a transparent way. For example, if an option is deemed unviable, the reasons for this will be outlined clearly.

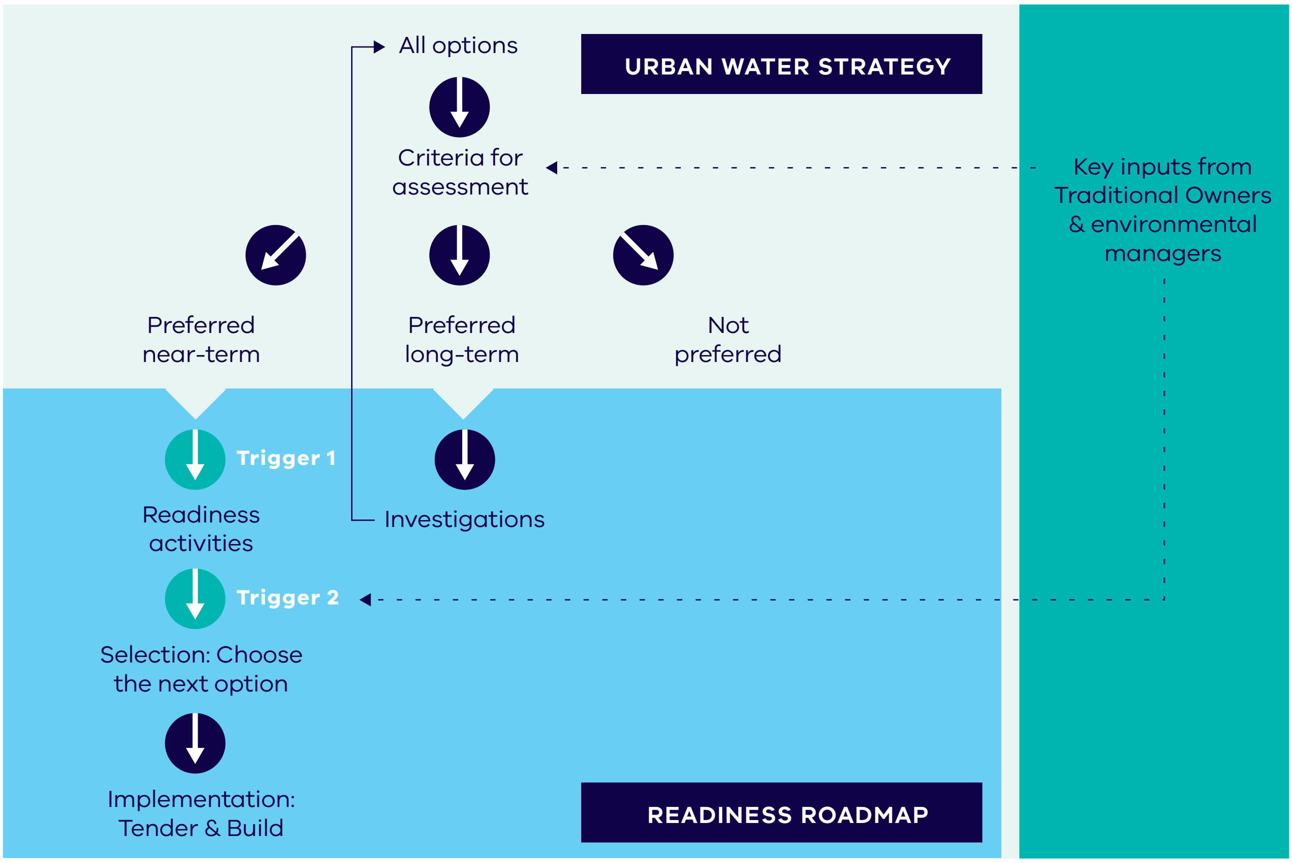


Figure 6.6: Relationship between Urban Water Strategies and the Water Supply Readiness Roadmap

6.4 Supplies that are fit for purpose

To meet future water needs, we will need to add new supplies incrementally. The quality, reliability and quantity of the water provided by each new source may influence how it is used. **Table 6.1** sets out the range of sources and potential uses. It shows that the sources most likely to be able to produce a larger volume and serve a wider area are desalinated water and recycled water, whereas rainwater tanks and stormwater are likely to provide more local opportunities. It also shows that some uses can be met by any source, provided the water is of a suitable quality, affordable and reliable. Importantly, desalinated water is unlikely to be suitable for use by Traditional Owners, agriculture or the environment in most circumstances, and this needs to be taken into account in preparing the Roadmap. Opportunities to supply water to Traditional Owners and the environment, whether directly or via substitution for river water, will be considered on a case-by-case basis as part of the readiness activities for each preferred near-term option.

When deciding how to add new supplies and share the resulting water (and costs), we will need to consider the needs and values of water users and the suitability of different sources for different needs. More details on proposals for sharing water sources — including using substitution to free up existing river water — in order to maximise the benefits for all users is provided in **Chapter 8**. **Chapter 7** provides more detail on how we can use *all* sources of water more effectively.

Image: Barwon Rivers meets the Leigh River, Inverleigh, Wadawurrung Country

Table 6.1: Suitability of sources of water in the near term for different needs

Source	Opportunities to provide medium- / large-scale new source (centralised and decentralised)	Suitability to meet different demands within the next five years	
		Potable	Non-potable: household
River water	**No** Most rivers in the region are fully allocated, with only small volumes of unallocated water available in a few rivers	**Yes** Existing water source only	**Yes** Existing water source only
Groundwater	**No** Most aquifers in the region are fully allocated	**Yes** Existing water source only	**Yes** Existing water source only
Stormwater	**Yes — decentralised** Stormwater harvesting and re-use schemes suited for public land and assets and new precincts Medium-scale / decentralised infrastructure will be critical for protecting waterways in growth areas.	**Potential** Exploration needed to ensure alignment with the risk framework	**Yes** Feasibility study under way for decentralised local projects
Rainwater (from roofs)	**Yes — decentralised** Best suited to single-lot scale, which helps reduced demand, but potential for decentralisation through larger scale rainwater-harvesting schemes	**Yes — limited** Issues with water quality need to be overcome to remove any public health risk	**Yes** Existing water source Feasibility study of increasing use under way
Recycled water	**Yes — decentralised and centralised** Site-specific opportunities for sewer mining and purple pipe schemes; potential for large volumes from large-scale treatment plants	**No** Potable water not currently a permitted use under Victoria's Recycled Water Guidelines	**Yes** Existing water source
Desalination	Yes — large, centralised Potential for large volumes, but may be limited by suitable sites along the coast	**Yes** Existing water source	**Yes** Specifically those connected to reticulated water supply networks

	Non-potable: industrial / commercial / public open space	Traditional Owners	Environment	Agriculture
	Yes Existing water source only	**Yes**	**Yes**	**Yes** Existing water source only
	Yes Existing water source only	**Yes**	**Yes** Particularly for groundwater-dependent ecosystems	**Yes** Existing water source only
	Yes Existing water source	**Limited** Opportunities to be explored with Traditional Owners	**Limited** Only for flow-stressed waterways where there is a net benefit to the environment — priority is for river water	**Yes** Integrated water management is required
	Yes Feasibility study under way	**Limited, but potential opportunities**	**No** Not at the scale required	**Limited** Large-scale rainwater tanks For example, intensive agriculture
	Yes Existing water source	**Limited, but potential opportunities**	**Limited** Limited application under environmental protection policy	**Yes** Provided through stand-alone infrastructure (Werribee Irrigation District, Tyabb–Somerville, Bellarine)
	Yes Specifically those connected to reticulated water supply networks	**Limited, but potential opportunities**	**No** Not feasible to pump desalinated water back to the top of the catchment	**Yes** BUT expensive —high cost might be prohibitive

7. How we use all sources of water

Image: Barwon Rivers meets the Leigh River, Inverleigh, Wadawurrung Country

At a glance

- As river water becomes scarcer in future, we need to make sure we are making the best use of all sources of water and better aligning the various water uses with fit-for-purpose sources of water.
- We need to understand how new sources of water, including centralised sources (such as desalination) and local sources (such as stormwater and recycled water) can be used to meet the region's water needs as well as help reduce the environmental impacts of urbanisation on receiving waterways.
- Water quality, quantity and reliability, and the timing of availability, are all important when assessing a potential new source of water. Where possible, we will use water from a variety of sources and provide levels of quality, quantity, reliability and timing that suit the various needs of different users.
- We know that by using desalinated water as urban water and drinking water we can leave more water in our rivers to nurture biodiversity and healthy ecosystems and to return water to Traditional Owners.
- Recycled water and stormwater can help to meet our growing water demands, although the process is not simple due to costs of additional storage, treatment and delivery infrastructure, and the difficulty in identifying who benefits and who can pay for using these sources.
- The Victorian Government will investigate:
    - options to ensure that the region's desalination capacity meets future needs
    - options to increase use of recycled water and stormwater where it is fit for purpose, freeing up drinking water for human consumption, returning water to rivers and returning water to Traditional Owners
    - the feasibility of large-scale recycled water distribution network(s) for Melbourne
- embedding integrated water management in land-use planning and management
- regulation for the efficient and effective funding of stormwater and recycled water infrastructure (see **Chapter 9**)
- outcomes-based targets for using all sources of water in catchment-scale Integrated Water Management plans (see **Chapters 10, 11** and **12**).

What we have heard so far

Feedback during early consultation showed support for:

- increasing the use of recycled water and stormwater by providing more funding for recycling and stormwater harvesting schemes
- making stormwater use mandatory in new developments
- increasing the use of recycled water where it is fit for purpose, including for agriculture and mine rehabilitation and to improve flows in local rivers and creeks
- education programs to raise community understanding of how recycled water could be used
- subsidies and rebates for using recycled water, stormwater and rainwater, particularly for commercial users.
- use of desalination as a legitimate way to increase water supply

7.1 Making the most of all available water supplies

Climate-resilient manufactured sources of water will reduce the Central and Gippsland Region's reliance on increasingly scarce river water. The Water Supply Readiness Roadmap proposed in **Chapter 6** will identify preferred water supply options for the near term, clarify roles and responsibilities for decision-making, and triggers for building new water supplies. To make the most of all sources of water, we need a range of actions at a range of scales (centralised and decentralised), both structural and non-structural (**Figure 7.1**). Different urban areas offer different opportunities for using manufactured water. For example, greenfield and urban renewal sites may present opportunities to use recycled water and stormwater that are not available in established areas. It is essential to identify such opportunities early in the planning process, so that the chance to construct infrastructure is not lost; once an area is developed, retrofitting becomes prohibitively costly and disruptive.

Different regulatory and policy approaches are needed for desalinated water, recycled water and stormwater, to make them viable options for improving our water security. This chapter sets out actions required immediately to make sure that these water sources can be used to meet our near-term needs, and changes required to make stormwater and recycled water a greater proportion of our total water supply. It also describes how integrated water management can help redefine the way we consider water when making decisions on land-use management, enabling us to consider *all* sources of water in planning. This work complements water efficiency activities (**Chapter 5**) and location-specific interventions (**Chapters 10** to **12**).

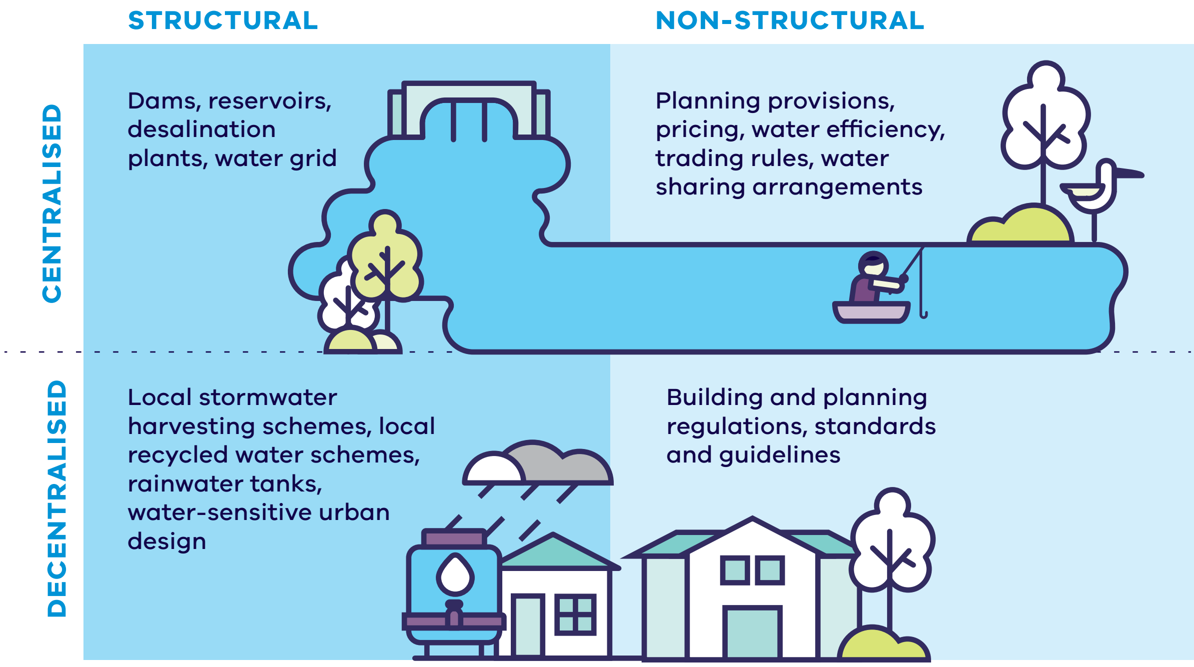


Figure 7.1: Different types of interventions required to manage water supply

Our growing cities, our regional communities, the environment and Traditional Owners all need water that is fit for purpose. We must understand the needs of each intended use, and match these to the quality, quantity, reliability and timing of different sources.

The Environment Reference Standard is a new tool made under the *Environment Protection Act 2017*. In Victoria, from 1 July 2021, the Environment Reference Standard sets out the environmental values to be achieved or maintained in Victoria (including for water). Environmental values are the uses, attributes and functions of the environment that Victorians value. The Environment Reference Standard also has indicators and objectives, for assessing and reporting on environmental conditions in Victoria. By providing a benchmark for comparing desired outcomes with the actual state of the environment, it enables an understanding of the current condition of the environment and a basis for assessing actual and potential risks to environmental values.

The Environment Reference Standard recognises Traditional Owner cultural values as important but does not yet state specific indicators or objectives for these values.

Proposed direction 7-1:

- **Traditional Owners will determine their own priorities for developing indicators and objectives to protect Traditional Owner cultural values recognised in the Environment Reference Standard.**

For manufactured water supplies (desalination and recycled water), the quality required by the end user will influence the level of treatment required and the price. For example, water for public open spaces, irrigation and non-drinking use at home require different levels of treatment, ranging from Class C to Class A recycled water treatment (see **Section 7.7**). Water quality parameters may also prevent the productive use of certain sources, such as highly saline water for irrigation, or nutrients that could harm the environment. Understanding these limitations and options to resolve them is essential for matching different sources to different uses, thereby maximising the use of all available sources of water for all uses. **Table 6.1** illustrates our current understanding of the suitability of various sources of water for different uses.

Wonthaggi Desalination

Water security benefits

The Victorian Desalination Project is a rainfall-independent source of water capable of supplying up to 150 billion litres of water a year – or about one third of Melbourne's annual water use. Without its regular contribution to our water supplies since 2016, Melbourne's storage levels would be 20 per cent lower today. The plant is not just turned on when our water supply reaches critical levels - the aim is to help make sure that our water supply doesn't fall to those levels in the first place. While there is a cost to run the desalination plant to secure our water supplies, the economic costs of severe water restrictions or water shortages are much worse and even with the desalination order for 2020-21, Melbourne's bills will remain the lowest of any capital in Australia.

Protection of the marine environment

Ongoing environmental management is a key focus of the desalination plant. The plant connects to Bass Strait via long intake and outlet tunnels, which not only draw in seawater but also protect the coast and marine environment by exiting beyond sensitive marine areas. The intake has been specifically located and designed to minimise the impact on marine life. Water is drawn from the ocean at a low velocity so that marine life can freely swim in and around the pipe without being drawn into the plant. The inlets are approximately 800 meters from the shore which further reduces the impact on marine life. There is also a marine life monitoring and reporting program in place - and it has been found that the impact to marine life from the project is negligible.

The desalination plant also has strict guidelines and requirements for any discharges to waterways or the ocean. The desalination plant has a discharge licence issued by the Environmental Protection Authority which specifies the quality of the water permitted to be discharged to the ocean. The EPA monitors the operator's compliance with the discharge licence as part of its annual reporting regime.

View the Victorian Desalination Project Environmental Management Plan **www.water.vic.gov.au/water-grid-and-markets/desalination/environmental-management**.

Renewable energy supply

In recognition that the desalination process is energy intensive, the government has made the commitment that the electricity used to operate the desalination plant is 100 per cent offset by renewable energy certificates. This commitment is in place regardless of the size of the water order.

AquaSure offsets all of the power used for operation of the plant and transfer pipeline by buying Renewable Energy Certificates* through AGL. This provides incentives for AGL to produce energy through renewable sources from its portfolio, including windfarms and solar.

The renewable energy requirements for the Victorian Desalination Project have set the highest benchmarks and have directly stimulated new renewable energy projects. The Victorian Government has increased the Victorian Renewable Energy Target (VRET) to 50 per cent by 2030. Victoria's Renewable Energy Action Plan outlines our approach to transitioning Victoria to a clean and modern energy future will create jobs and build skills and capabilities across the sector.

The impact on bird and bat populations from wind farms, which are one source of renewable energy, is minimal, with independent monitoring programs finding negligible effect on the populations of threatened species.

You can view the reports from these programs in detail, including the exact numbers of bird deaths, linked from the AGL How We Source Energy page.

* Renewable Energy Certificates (RECs), also known as Renewable Energy Credits, are tradeable, non-tangible energy commodities that represent one megawatt-hour of electricity generated from a renewable energy source (as defined under legislation).

7.2 The role of desalinated water

The Victorian Desalination Project underpins water security for Melbourne, Geelong and other regional areas — including South Gippsland — by either indirectly or directly adding to water supplies delivered to those cities and towns. Desalinated water is no longer just required in drought years, but a resource that we are using all the time to help stabilise and contribute to the region's water supplies. The equivalent of more than 20 per cent of Melbourne's storages has come from desalination since 2016.

As described in **Chapter 6**, to manage our water supplies outside a crisis such as drought, we need to find ways to add water to our supplies regularly in future rather than once in a generation. For example, to meet Melbourne's forecast annual water shortfall of 450 gigalitres by 2065, we need to source 50 gigalitres (50 billion litres) of additional water every five years on average. This may be achieved with incremental additions at a local scale, combined with larger augmentations, which might be built at once or in stages.

We need to be in a state of readiness to add new water supplies, such as desalinated water, when required, while keeping our focus on water efficiency and local or decentralised solutions that will help defer or even avoid the need for larger augmentations. Based on current forecasts, water supply shortfalls for Greater Melbourne and many connected regional cities and towns is expected this decade. Desalinated water remains a viable short-term option because it can be fed directly into the drinking water supply at the volumes required by our cities and towns. In the longer term, new regulations and policies will support a greater role for other water sources.

Victoria's existing desalination plant at Wonthaggi was designed to allow a 50-gigalitre expansion, to deliver 200 gigalitres per year to the Melbourne supply system. Further work is required to identify and assess the viability of options for additional desalination capacity and significant community engagement and input will inform any future decisions.

Proposed direction 7-2:

- **The Victorian Government proposes to investigate options to ensure that the region's desalination capacity meets future needs.**

7.3 Sustainable management of groundwater

Groundwater is a critical and highly reliable resource across Victoria. Use has been relatively stable over the past two decades. In a drying climate, groundwater is expected to be increasingly important for supplying agriculture, towns and industry. In most parts of the Central and Gippsland Region, groundwater use is capped and fully allocated (**Figure 2.9**), which limits opportunities to use groundwater to meet additional water demands. The take of groundwater must be balanced against the aquifer's ability to recharge, the effect on other water users, connected surface water resources and groundwater dependent environments, and the impact of using the water on land.

So far discussions between Traditional Owners and the Victorian Government about cultural values and water use have focused on surface water. However, it is important that we consider the cultural value of groundwater as well. Groundwater is not immediately visible in the landscape and makes up only a small proportion — about 10 per cent — of current water use across the region. We need to acknowledge the cultural importance of groundwater to Traditional Owners and draw on current scientific and cultural knowledge across the region to inform our management of this important resource.

Greater demand for water means that people are increasingly considering how to access deeper aquifers or use saline groundwater. The use of these resources has a higher monetary cost, and using increasingly saline groundwater can damage land and connected surface water sources.

Overall, Victoria's current groundwater management framework is working. Nevertheless, we must review the way we manage groundwater to ensure that we can meet new challenges, explore opportunities, and meet sustainability goals.

The Victorian Government will develop a statewide Groundwater Management Strategy to ensure that our groundwater resources will be managed to support a prosperous economy and thriving communities, promote Traditional Owner cultural values, and ensure the long-term sustainability of the groundwater and connected environments.

The Groundwater Management Strategy will provide a roadmap for review and improvement to the licensing and management of groundwater. The Groundwater Management Strategy will:

- identify guiding principles for groundwater management
- identify priority areas for improvement and reform
- develop a program to review and improve groundwater resource management and licensing.

Proposed direction 7-3:

- **The Victorian Government proposes to develop a state-wide Groundwater Management Strategy and will seek input from groundwater licence holders, Traditional Owners, licensing delegates and all other interested stakeholders.**

7.4 Increasing the use of stormwater and recycled water

The community has told us that they want to use more recycled water (treated wastewater) and stormwater where it is fit for purpose.

Recycled water and stormwater that are fit for purpose can meet many of the region's water needs that currently rely on river water and groundwater. Recycled water and stormwater may not always be the cheapest options, due to additional costs of treatment and distribution, but could bring public and environmental benefits not offered by other sources. Specifically, using these sources can delay the need to augment a water supply, and can reduce pollutants and avoid altering the flow into receiving waterways.

Recycled water can offer farmers located near supplies large volumes of reliable, relatively rainfall-independent water, and can thus provide opportunities to return water to rivers (if farmers reduce their reliance on river water entitlements). Water savings generated from these schemes can be used to support agricultural productivity in the region and to return water to the environment or Traditional Owners.

The crucial questions of who should pay for increased use of recycled water and stormwater, and how, are discussed in **Chapter 9**.

Community perceptions of risks to human and environmental health can prevent us from realising the full potential of recycled water and stormwater. Though such perceptions are not universal, they must be acknowledged as a potential barrier to greater use of manufactured water. However, there are significant opportunities to provide water security if we can build community confidence by demonstrating best-practice science, enforcing strong regulation, and talking with the community about their concerns and the potential benefits.

In the past, our management of stormwater and recycled water has focused on environmental protection: treating the water to an agreed environmental standard, so that it can be safely discharged into the environment or applied to land. We have not always considered changes to the flow regimes of receiving waterways, or Traditional Owners' responses to seeing their waterways used as a drainage system. But this philosophy is changing to a more holistic one, encompassing the numerous benefits of using stormwater and recycled water, as well as environmentally sensitive disposal. For example, in urban areas, maintaining the current flow regime and protecting waterway condition require the capture of large volumes of stormwater run-off, rather than releasing it into drains and waterways (as was done in the past). In the future, stormwater could be infiltrated into groundwater to replenish waterways (which are losing baseflows due to the creation of more impervious surfaces) and used for purposes such as irrigating sports grounds and crops.

The treatment, storage and distribution costs of stormwater and recycled water are based on complex formulae, often unique to a particular setting, and require local solutions. It is not a straightforward process for local authorities or communities to decide whether to use recycled or stormwater, or both, for non-drinking purposes. They must consider proximity and availability of the resource, cost of treatment and distribution, availability of storage, flood risks, and the environmental benefits or costs of reducing discharge to the environment. Also, household demand is declining, while other non-drinking uses such as irrigation for active or passive recreation or street trees are generally poorly funded. Limits on demand and cost of treatment and distribution can make the use of recycled water cost-prohibitive, despite its many benefits. For these reasons the Victorian Government is implementing integrated water management, which considers planning at a local scale to understand local needs and local benefits, in order to make the most of all sources of water (see **Section 7.12**).

Although there are barriers to increasing the use of stormwater and recycled water in some localities, the benefits can be important for a region's prosperity, liveability and productivity. Large-scale recycled and stormwater systems can be used for farming, and for urban irrigation to create cooler and greener communities. Importantly, using these new decentralised sources can free up precious drinking water and reduce extraction from already stressed rivers, thus helping to preserve these supplies for future generations and creating opportunities to return river water to Traditional Owners.

Proposed direction 7-4:

- **The Victorian Government proposes to work with local authorities to build community confidence in increasing the safe and suitable use of recycled water and stormwater.**

Integrated Water Management programs in the Central and Gippsland Region

- Since 2017, Victoria's integrated water management program has supported 45 projects in the Central and Gippsland Region to increase the use of stormwater and recycled water for non-drinking purposes. The Victorian Government and partners have invested more than $13 million to strengthen regional water security, protect waterways and landscapes, and reinforce community connections to the environment.
- Of the 15 integrated water management forums established across Victoria, nine are in the Central and Gippsland Region. These forums identify, prioritise and oversee the implementation of collaborative water opportunities. Making better use of all sources of water in our cities and towns is a focus for the water sector, Victorian Government, local governments and Traditional Owner groups.
- As a result, a new stormwater harvesting facility in the City of Maroondah will supply 13 megalitres per year to irrigate four sports fields and nearby community parks, creating more space for active recreation while also improving the water quality of Tarralla Creek.
- In the Werribee Catchment, an expansive recycled water network will supply an additional 477 megalitres per year to the Werribee Open Range Zoo, Werribee Park Mansion, and local parks and gardens. Recycled water will also irrigate open space in Werribee's city centre, reducing potable water use by 280 megalitres per year.
- The integrated water management program has helped fund creek channel works and improved stormwater management and riparian vegetation for the most northerly concrete section of Moonee Ponds Creek.
- Mornington Peninsula Shire Council is working on a demonstration project that will distribute 80 megalitres per year of Class A recycled water for irrigating public open space and recreational areas.
- Recycled water and stormwater could also help future-proof major food-producing and horticultural areas, through innovations such as aquifer storage and recovery. Water corporations are investigating aquifer storage and recovery to help Western Port agribusinesses continue to feed the growing Central and Gippsland Region.
- Other examples of individual organisations and public and private entities using stormwater and recycled water are presented in **Chapters 10, 11** and **12**.

Image: Agriculture fields, Werribee Irrigation District, Werribee South, Bunurong Country

7.5 Understanding the overall availability of potential sources of water

Overall water balances

To evaluate all the current and future uses of recycled water and stormwater, we first need to know where and to what extent these types of water are available, and their overall role in a catchment's water balance.

To calculate the availability of stormwater and recycled water, and its potential for use by a growing population, the Central sub-region and 20 representative regional towns are using catchment-scale integrated water management planning to calculate water balances (see **Section 7.12**). A water balance calculates current annual volumes (rainfall, evapotranspiration, use of drinking water, stormwater and sewage generated, and recycling volumes) and pollutants, as well as modelling for volumes in 2050 (**Figure 7.2**). This work responds to a lack of data on the advantages and disadvantages of using stormwater and recycled water for a range of purposes, including water security. Water balance data is useful when deciding on the best locations for integrated water management projects for greatest local benefit.

Image: K road Cliffs, Werribee river, Bunurong Country

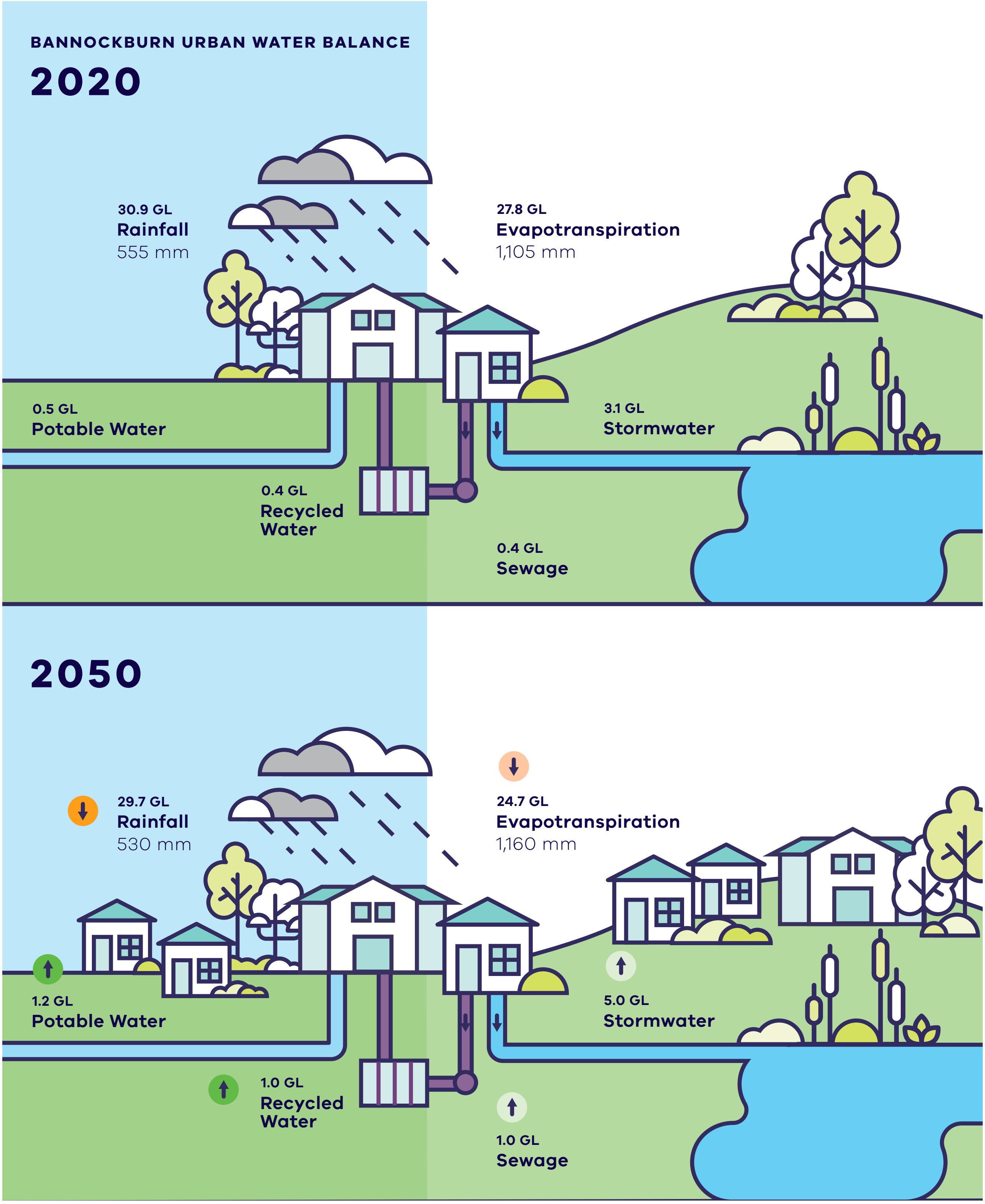


Figure 7.2: Example of a regional water balance for Bannockburn — volumes 2020 to 2050

Proposed direction 7-5:

- **The Victorian Government proposes to complete water balances for metropolitan Melbourne (through catchment-scale Integrated Water Management Plans) and selected regional centres to improve our knowledge base on all sources of water and to inform future water management planning decisions.**

Recycled water

In the Central and Gippsland Region, between 58 and 95 gigalitres of recycled water is re-used each year. This is up to 28 per cent of the total wastewater treated, depending on several factors but largely in response to seasonal conditions (less is used in wet years). A large proportion of the treated wastewater must therefore be discharged into waterways, bays and the ocean. In regional communities, particularly in Gippsland, higher percentages are recycled for irrigation, where it can be put to productive use and is often cheaper than meeting the stringent environmental (water quality) standards for releasing treated wastewater into inland waterways (**Figure 7.3**).

Water corporations report annually on recycled water volumes produced and used, as part of the Essential Services Commission's collection of water performance indicators. These indicators are consistent with those in the National Urban Water Utility Performance Reporting Framework, which is being reviewed (BOM, 2019a). There is an opportunity to improve this reporting to better understand recycled water use and availability, and ensure data is more consistent and accurate. In turn this could lead to increased uptake of recycled water, as industries that are limited by water availability may be able to align their business programs to these sources of water — for example, increased irrigation or agriculture, or emerging industries such as green hydrogen.

Image: Purple tap, Werribee, Bunurong Country

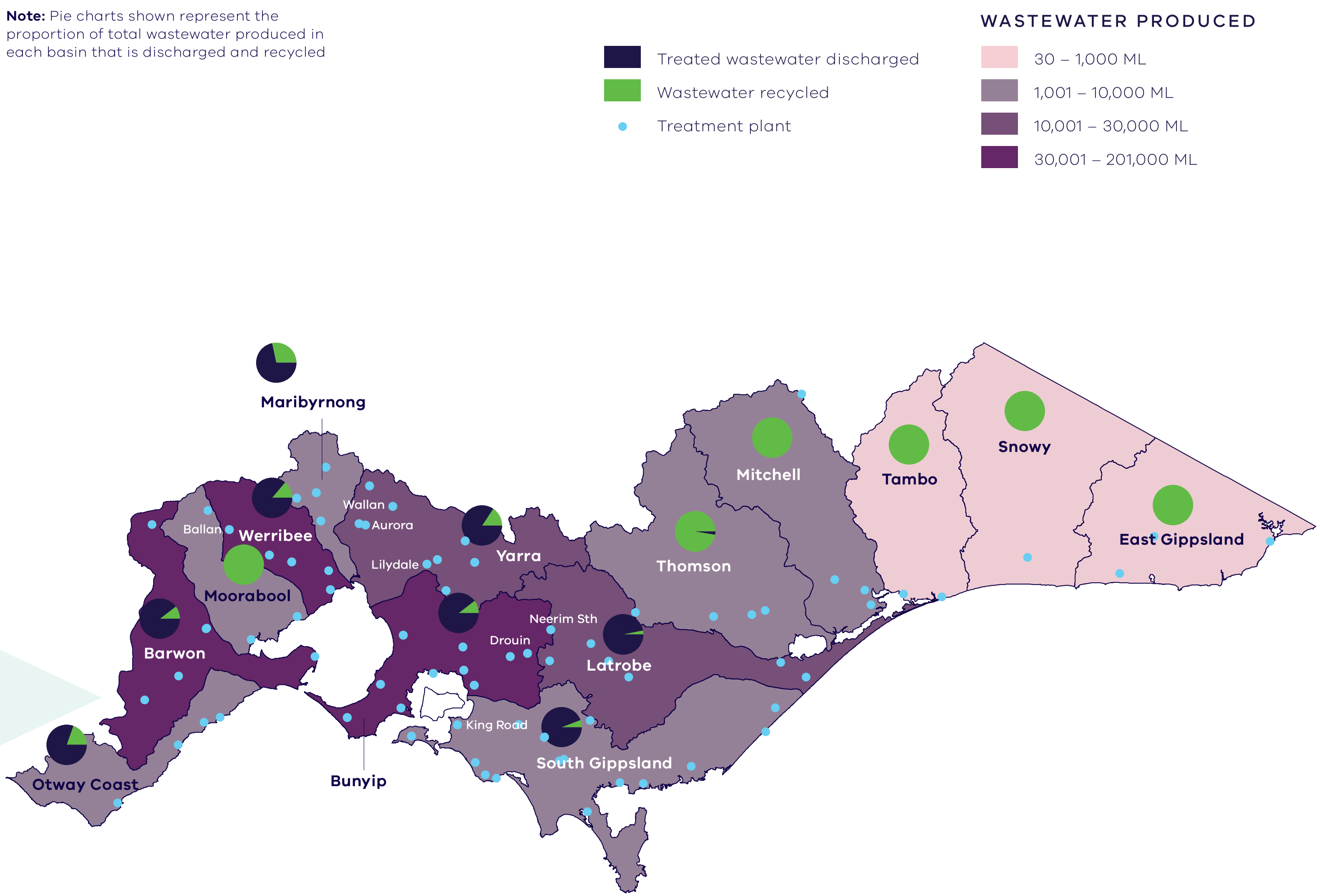


Figure 7.3: Potential for use of recycled water

Proposed direction 7-6:

- **The Victorian Government proposes to assess the need for clearer guidance on recycled water accounting and reporting, to increase the consistency and accuracy of recycled water data for a better understanding of recycled water use and availability.**

Stormwater

Stormwater is rainwater that falls onto hard surfaces in urban areas — such as roofs, roads and footpaths — and flows through drains into waterways and bays. Uncontrolled stormwater run-off interrupts the natural flows of waterways and can carry pollutants and chemicals that harm waterway health. Stormwater is a major environmental threat and cause of localised flooding in highly urbanised areas, but could become a valuable resource, rather than a waste product, if managed in a more integrated way. As Melbourne's urban footprint expands, the volume of environmentally damaging stormwater will increase. Performance objectives in the Healthy Waterways Strategy Catchment Programs outline that, by 2050, a combined stormwater volume in excess of 80 gigalitres per annum needs to be captured and 20 gigalitres per annum needs to be allowed to soak into the ground, to protect and/or restore waterways across catchments managed by Melbourne Water.

To manage the environmental impacts of stormwater, the Environment Protection Authority is updating the Best Practice Environmental Management Guidelines to reflect our current level of understanding of the science, which will be reflected in their new regulatory framework as a 'state of knowledge'. This will complete existing requirements to manage stormwater in the Victorian Planning Provisions.[13]

Collecting, storing and treating stormwater offer significant opportunities to meet water needs in a drier climate, and to ease pressure on drinking water supplies. Treated stormwater can be used on sporting fields, open spaces and street trees and thus help keep communities cooler and greener, which improves people's health and wellbeing. Investing in stormwater harvesting to reduce environmental damage and contribute to water security has the potential in some locations to provide shared benefits and improve the economic viability of these schemes.

New urban development offers a unique opportunity to embed large-scale stormwater into the urban footprint. The benefits of this are threefold. First, stormwater provides a sustainable source of locally produced water. Second, stormwater re-use protects vulnerable waterways from the harmful impacts of urban run-off. Third, stormwater project can provide local amenity value by locating highly valued waterbodies in new growth areas.

In order to unlock large-scale opportunities for stormwater capture and re-use it will be necessary to work closely with urban planners to build schemes into the early stages of planning. For example, land will need to be set aside to allow for proposed stormwater harvesting schemes. Further work is necessary to embed such thinking into urban planning mechanisms (see **Section 7.12**).

Roles and responsibilities for stormwater are in some cases ambiguous – particularly in the Port Phillip and Westernport Catchment, where responsibilities are shared by Melbourne Water and local councils. The Victorian Government is partnering with Melbourne Water and local councils to clarify roles and responsibilities. This will be critical in unlocking opportunities for stormwater capture and re-use.

7.6 Investigating a large-scale recycled water and stormwater network

One of the greatest disincentives to increasing the use of stormwater and recycled water is the cost of building distribution networks to move the stormwater or recycled water from where it is produced to where it is required. Although urban precincts, greenfield suburbs and agricultural areas would all benefit from climate-resilient and diverse sources of water to support future liveability and productivity, the scale of the task may prevent this opportunity from being realised. See **Chapter 9** for more on how we will invest to secure our future water supplies.

We know that many of the most successful recycled water projects are located near a sewage treatment

13 See **www.water.vic.gov.au/liveable/stormwater/Stormwater-management-for-urban-development.**

plant. The supply of water to the Werribee Irrigation District and the Geelong Refinery from Barwon Water's Northern Water Plant saves the local community more than 1 gigalitre of water each year. Opportunities for larger scale localised stormwater harvesting have also been identified in Sunbury. However, opportunities for large-scale use of stormwater or recycled water near a treatment plant or where a stormwater drain collects and discharges can be limited by the location of users.

Another potential opportunity to match sources of stormwater and recycled water to demand is to build a large-scale alternative water distribution network around Melbourne, or across parts of Melbourne, to connect major treatment plants with potential end users. Large sources of recycled water and stormwater could be used to meet potentially high levels of demand from farmers and industry, and for non-drinking uses in homes and workplaces if available at the right place and time. This water could help meet future demands but could also provide an opportunity to supplement or replace the use of existing river water supplies. In the latter case, another benefit would be the return of water to rivers, for environmental use or for Traditional Owners.

The Assessment of a Citywide Alternative Water Network is investigating opportunities to build a large-scale alternative water network, to achieve efficiencies and reduce infrastructure costs. This network could provide a climate-resilient supply of recycled water or stormwater for current, growth and infill development areas and expanding business precincts. Preliminary findings show the potential to offset a total of 21 gigalitres of potable water across urban developments, growing to 39 gigalitres by 2050. There is also strong potential to supply agribusinesses with stormwater and recycled water — up to 345 gigalitres by 2050, of which 50 gigalitres could also offset potable water (see **Chapter 11**).

Integrating the construction of this water infrastructure with major projects could provide an immediate boost to Victoria's economic recovery and further secure the future of our local sources of food. Further investigations will clarify the costs and benefits to the community, to guide future decisions.

Proposed direction 7-7:

- **The Victorian Government proposes to investigate the viability of a citywide alternative water network, to increase the supply of stormwater and recycled water for non-drinking uses.**

Image: Victorian Desalination Project, Wonthaggi, Bunurong Country

7.7 Improving regulation for recycled use

In 2021 the Victorian Government published new guidance for large-scale recycled water schemes that supply Class A, B or C recycled water. For recycled water suppliers, managers, users and regulators, the new guidance clarifies, simplifies and streamlines approval and reporting processes for these schemes.

Classes of recycled water in Victoria

In Victoria, recycled water is classified into three classes (A, B and C) that represent the minimum standards of treatment for categories of use. The level of treatment increases with the potential for higher levels of human exposure to the water, reflecting the risks associated with particular uses.

> ***Class A*** *is water designated for high-exposure uses, so it is the highest quality recycled water. It is suitable for use in residential developments (for purposes such as washing clothes, flushing toilets and watering gardens), irrigation of open spaces with unrestricted public access and irrigation of edible crops intended for raw or unprocessed consumption.*
>
> ***Class B*** *recycled water is generally used on dairy cattle grazing land. It can also be used for industrial use, subject to restrictions on human contact.*
>
> ***Class C*** *may be used in urban areas that have controlled public access (for non-potable purposes only), and in agriculture — for example, on human food crops that will be cooked or processed, grazing or fodder for livestock — and in industrial systems with no potential worker exposure.*

The second phase of this effort to improve regulation of recycled water in Victoria involves updating guidelines for the use of recycled water for irrigation. A field sampling project is also underway to better understand emerging contaminants in recycled water, and how these should be considered in approval processes.

Victoria's current drinking water regulations ensure that drinking water supplies meet specified water quality standards. Purified recycled water is not currently a permitted source of drinking water. We will continue to consult the community on future water sources, how to best use stormwater and recycled water, and advance our understanding of the technology, regulation and community acceptance of using recycled water for this purpose.

Proposed direction 7-8:

- **The Victorian Government proposes to continue collaboration to review, streamline and update the regulatory framework in order to support increased use of recycled water where it is safe and suitable.**

7.8 Improving the regulation of stormwater use

Rights to stormwater are complex and sometimes unclear. Due to this, the opportunities for greater stormwater capture and use may be limited. For example:

- councils are not authorities under the Water Act, but manage drainage under the *Local Government Act 1989* (Vic). They are not permitted to sell stormwater harvested from their drains, but can use it for their own purposes (such as on sporting fields, or for use by a third party)
- Melbourne Water has responsibilities for managing drainage for catchments with areas greater than 60 hectares within Greater Melbourne. Melbourne Water does this for the purpose of protecting waterways and is not required to consider stormwater as a resource as part of their water security responsibilities
- metropolitan water retailers and regional urban water corporations are responsible for water supply and wastewater management. Again, they do not have responsibility for managing stormwater.

Stormwater that is in the drainage network of an authority (Melbourne Water) or that enters an urban waterway can be allocated under a take-and-use licence. In the Central and Gippsland Region, for example, to date 57 licences have been issued by a licensing authority (under delegation from the Minister for Water), allowing the use of up to 3.7 gigalitres of stormwater per year.

Considerable progress is being made in encouraging greater use of stormwater by water corporations and local councils through greater collaboration via integrated water management forums (see **Section 7.12**). As part of this draft Strategy, the Victorian Government will identify regulatory gaps, remove barriers to uptake, calculate costs, and investigate community perceptions, to improve the management of stormwater as a water source. This will help water corporations and councils build new partnerships with water users who could take advantage of stormwater for their operations, such as golf courses, sporting clubs and public gardens. It could also unlock new opportunities to collaborate, such as working with Traditional Owners on using and managing stormwater on Country.

Chapter 5 discusses the potential for greater use of rainwater tanks to capture and use rainwater before it hits hard surfaces, such as footpaths, and becomes stormwater.

Proposed direction 7-9:

- **The Victorian Government proposes to clarify stormwater licensing (and caps on extraction) for assets forming part of a stormwater management system.**

Proposed direction 7-10:

- **The Victorian Government proposes to clarify the rights of local councils to use stormwater on their own land (for example sporting fields) and to arrange the supply of or access to stormwater in local council assets.**

7.9 Recycled water and agriculture

Agricultural businesses in the Central and Gippsland Region use a range of water resources, including river water, groundwater and, in areas such as the Werribee Irrigation District, fit-for-purpose recycled water. For Werribee irrigators, recycled water from the Western Treatment Plant complements water entitlements from the Werribee River and groundwater supplies.

Existing sources of water for agriculture are decreasing due to a drier and more variable climate. As water requirements for farming change in the future, irrigators will need to continue to make the most of all sources of water to maintain their farms' viability and continue to produce high-quality agricultural products. The Victorian Government is looking at new opportunities to help farming businesses in the Central and Gippsland Region take advantage of all local sources of water that can help build their climate resilience, increase their productivity and foster regional economic development.

Recycled water is already providing farmers in some areas with a secure and consistent supply of affordable water, particularly where properties or irrigation districts are close to major water treatment infrastructure. Funding from state and federal governments for the new Western Irrigation Network to the west of Melbourne and recycled water supplies along the Bellarine Peninsula will support agricultural expansion in the region.

Western Irrigation Network

The new Western Irrigation Network will connect dryland farmers in the Parwan–Balliang Agricultural District, to the west of Melbourne, to a guaranteed supply of Class C recycled water by 2022 (Melbourne Water 2019). The scheme will initially supply 1.7 gigalitres per year, increasing as irrigators expand and adapt. By 2050 the scheme could supply 19 gigalitres each year and irrigate up to 4,500 hectares of high-quality land. This Greater Western Water project will also help to manage the increasing volumes of wastewater in the region — particularly in the Melton, Sunbury and Bacchus Marsh areas — and reduce discharges into the environment.

Image: Angus beef cattle above dried creek bed, Elaine rural property, Wadawurrung Country

Recycled water along the Bellarine Peninsula

Barwon Water is extending the supply of recycled water for agriculture and horticulture, including vineyards, along the Bellarine Peninsula. The project involves upgrading an existing water reclamation plant to provide a higher water quality, offering growers a guaranteed water source at an affordable price. The $11 million project is jointly funded by the Australian Government ($5.5 million), the Victorian Government ($2 million) and Barwon Water ($3.6 million).

Although there is significant potential for increasing the use of recycled water for agriculture in and around urban areas, recycled water will not be suitable for all areas. Realising the opportunities will require local solutions. Recycled water is often significantly more expensive than existing river water or groundwater supplies, though the price is often subsidised to encourage use. Water quality standards need to be appropriate for crops, and supplies must be reliable to meet irrigation demands. In some cases, the prohibitive cost of treating recycled water to a high quality means that farmers mix brackish or saline recycled water with other sources such as river water.

To encourage further uptake of recycled water, the Victorian Government is helping water corporations and industry secure funding for recycled water projects that can bring many benefits, such as supplying recycled water for agriculture and reducing wastewater discharges. In 2021 the Victorian Government and water corporations secured Australian Government funding for several recycled water projects, including the expansion of recycled water supplies on the Bellarine Peninsula, writing detailed business cases for the Pakenham–Cora Lynn and Tyabb–Somerville recycled water projects, and preparing a preliminary business case for the Sunbury–Bulla Keilor Agricultural Rejuvenation Project.

At the time of writing this draft Strategy, the Victorian Government is consulting the community on how to better protect Melbourne's green wedges and keep farms on urban fringes working and producing for generations to come (DELWP, 2020d). These discussions have highlighted the critical importance of reliable access to water for strategic agricultural land. The government will continue to work with the water industry, planning sector and agricultural industry to identify and support future agricultural demands for water and consider ways to make the most of all water sources, including recycled water.

Proposed direction 7-11:

- **The Victorian Government proposes to support the long-term resilience of Melbourne's green wedges and the Central and Gippsland Region's agricultural sector by identifying future agricultural demands for water and considering ways to make the most of all sources of water.**

7.10 Recycled water and stormwater for environmental benefit

Waterways in the Central and Gippsland Region need significant additional volumes to meet critical flows, support the survival of native species and help to preserve these supplies for the future (see **Section 3.4**). To help return more water to the environment, the Victorian Government is exploring opportunities to use all water sources to substitute for river water extraction. Where substitution is not possible, the *Environment Protection Act 2017* (Vic) allows for treated wastewater to be released into waterways under certain circumstances if strict requirements are met.

Instead of seeing this discharge as an environmental management problem, we are starting to see the important role these releases can play (if at the right time, of the right quality and in the right quantity) in environmental flows. For example, the Ballarat South Wastewater Treatment Plant discharges around 20 megalitres of recycled water into the Yarrowee and Leigh rivers each day (see **Chapter 12**).

The Victorian Government will investigate ways to maximise the environmental benefits of releasing treated wastewater and stormwater at times that match the natural flows of the river system.

Proposed direction 7-12:

- **The Victorian Government proposes to develop and release, by 2022, statewide guidelines for using recycled water for environmental release into waterways.**

7.11 Traditional Owner access to all sources of water

Chapter 4 describes Traditional Owners' aspirations for water rights. Traditional Owner sovereignty and self-determination in water are fundamental to water management in Victoria. Traditional Owners have an obligation to care for Country and cultural heritage, and will determine how to use their own water rights, in accordance with their own laws and cultural protocols. **Chapter 8** outlines how these aspirations can be met for river water and groundwater, but greater use of all sources is important to support this, including through direct access to sources and indirectly through the freeing up of river water by substituting it with other sources such as stormwater or recycled water. For principles to guide the allocation of water to Traditional Owners, see **Section 8.2**.

7.12 Integrated water management: water-efficient communities and infrastructure

Integrated water management considers how the delivery of water, wastewater and stormwater services can contribute to water security, public and environmental health, and urban amenity. Water and land-use planners, including Traditional Owner groups, work together to find smarter ways to use all sources of water, for example in the design of a new suburb or development. This challenges Victoria's method of water management since colonisation: a single supply source (of potable water) and two discharge systems to move stormwater and wastewater away as quickly as possible.

Embedding integrated water management into the planning and management of urban water services allows a greater range of options to be identified and evaluated at the outset of new developments. Now, more than ever, we need to consider how our water systems can be designed to provide broader benefits to the community — for example, improved urban amenity, reduced flooding and healthier landscapes — at a lower cost. However, this cannot be achieved by the water sector alone. Meaningful, ongoing collaboration is needed between planners, the water sector and local government.

Victoria's 15 integrated water management forums bring together the water sector, land planners and local governments, to identify and prioritise projects and oversee their implementation. One of the distinctive features of integrated water management is the need to plan at a range of scales, so that the nature and type of intervention required will be based on the particular circumstances of the local area.

Planning integrated water management at a range of scales

An integrated water management (IWM) plan is a strategic planning tool that sets out opportunities to improve urban waterways and landscapes and make better use of all sources of water in our cities and towns.

An IWM plan considers how the whole water cycle functions, balancing climate effects, population growth and urbanisation with environmental, cultural, social and economic values. An IWM plan can be developed on different spatial scales to reflect unique geographic characteristics and water-related opportunities (**Figure 7.4**). It shows the way for various organisations, including local government, water corporations and Traditional Owner groups, to work together to realise those opportunities through collaboration and investment in water infrastructure.

It is important for IWM planners to consider how different planning scales will complement each other and enable alignment of water-related objectives and opportunities:

- **Catchment-scale** IWM plans take a comprehensive view of a region's water cycle performance, including the volumes and quality of water resources used and generated over a large area**.** This scale can support strategic regional planning for major water infrastructure investments.
- The **sub-catchment** or 'corridor' scale may be flexibly defined to complement a range of significant land uses, such as transit or growth corridors. This scale uncovers water-servicing opportunities that cater to unique geophysical characteristics and community needs.
- A more place-based IWM planning approach is taken at the **precinct scale**, with a focus on open liveable spaces water infrastructure (for example a linear park along a river or a wetland) to support urban amenity and specific development types.
- **Lot-scale and development-scale** IWM plans are for parcels of land that have been subdivided for development. Depending on the site characteristics, development type, scale and geographic location, an IWM plan may be required under local planning laws to mitigate local flood risk, harvest rainwater or manage stormwater flows.

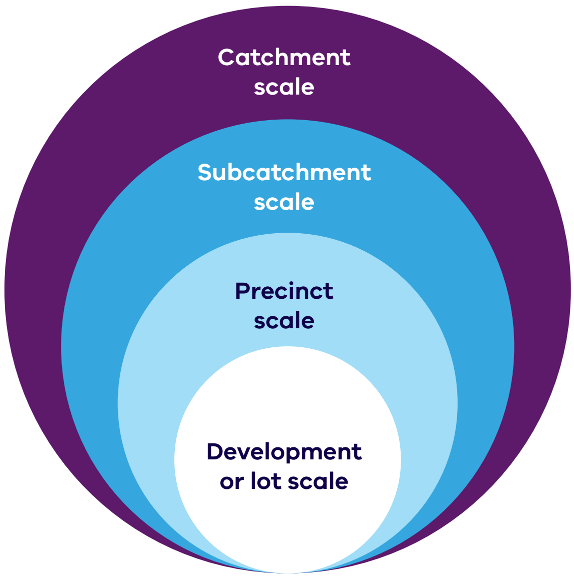


Figure 7.4: Cascading geospatial scales of IWM planning

Embedding integrated water management in land-use planning and infrastructure projects

New developments and suburbs provide opportunities to embed integrated water management solutions into land-use planning decisions and urban design — to increase the value and use of water in our suburbs. It is important to explore integrated water management opportunities early on when planning urban development, both in greenfield development areas and in urban renewal centres. The coastal town case study below highlights the importance of an agreed IWM plan. This saves money and leads to cooler and greener communities, healthier environments, and better flood protection. For example, passive irrigation — using gravity to direct stormwater run-off to where it is needed — can be used on street trees to create fuller canopies. Retrofitting passive irrigation systems can cost up to 13 times more per tree, on average, than installing them at the start.

Challenges in implementing an IWM plan in a rural coastal town in Victoria

Following a detailed options assessment, a regional water corporation identified a stormwater harvesting scheme as the most effective and economical means to deliver recycled water to a new residential development, while also benefiting a fragile coastal environment.

Key challenges included land area provision for the treatment plant, suitable sizing of a stormwater retention basin and system infrastructure to support the stormwater harvesting scheme, and a lack of clarity regarding financial impacts and asset management responsibilities.

As the residential development progressed, the council placed an additional requirement for 5,000 litre water tanks to be connected to toilets on each lot. As a condition of connection to the water supply, recycled water was already required for toilet connection and garden areas (front and back) at each property.

Consequently, there was considerable confusion from each property owner and the different drivers (stormwater retention and reduced potable water consumption) and responsibilities were poorly understood.

Although the intent was admirable, the approach adopted by local government and the water service providers was not coordinated.

In future, a placed-based IWM outcome for the site should be agreed to at the beginning by the collective service providers. This will require better coordination from water service providers and local government to work across the water cycle, and deliver sustainable and effective solutions for the community and protection of the environment in the long term.

As ageing infrastructure is replaced and precincts are renewed, integrated water management can be used to build more water-efficient and resilient communities. For example, houses can be designed and built to help households reduce their water and energy usage, leading to lower household utility bills.

Integrated water management not only supports water sector objectives, but can also boost land sales and prices for properties and developments that feature water-sensitive urban design. More than 85 per cent of home buyers surveyed in Melbourne's growth corridors said they support water-sensitive urban design in their neighbourhoods (Lloyd et al., 2002). Given many of the growth areas are in the naturally drier parts of the region (to the north and west of Melbourne), integrated water management offers additional benefits from increasing climate resilience of new developments (**Figure 7.5**).

Notable examples of Victorian developments that have integrated land and water planning include:

- Aquarevo, a residential development by South East Water and Villawood Properties, which will see 470 homes plumbed with drinking water, recycled water and rainwater, reducing the estate's reliance on drinking water by 70 per cent (see **Chapter 5**)
- Aurora, a master-planned community by Development Victoria, which has water-sensitive urban design and purple pipes (recycled water) connected to homes and public amenities
- The Cape at Cape Paterson, with extensive stormwater management in its coastal community design and a minimum 10,000-litre rainwater tank for every home
- Salt Torquay, a One Planet Living community developed by Barwon Water, which includes 10,000-litre rainwater tanks, permeable driveways, indigenous plant species, streetscapes and a nature-play space integrated with stormwater management.

VALUE OF INTEGRATED WATER MANAGEMENT (IWM) PLANNING AND DELIVERY

WATER SECTOR	COUNCIL/DEVELOPERS/COMMUNITIES
Provides certainty An agreed IWM plan provides clarity for both developers and the water sector regarding how an area will be serviced, the asset that will be required, and a common platform to understanding and discussing funding requirements.	
Contribution to water security Reduces demands on potable supplies due to maximising use of all sources of lands adjacent to waterways.	**Improved liveability and desirability of suburb** Building climate resilient developments through retaining water in the landscape - managing the heat island effect.
Waterway protection Reduces stormwater entering urban waterways and protection of lands adjacent to waterways.	**Branding/marketing** Opportunity to brand and sell sustainability credentials of the development (point of difference from other developments).
Lowering infrastructure costs Can help delay timing of centralised augmentations and reduce size of local assets and addition of decentralised solutions (local water supplies)	**Providing and protecting community assets** Water based amenity assets (lakes, wetlands) and drought proofing of public assets (sporting grounds and gardens) through provision of access to stormwater and recycled water.
Meeting wastewater obligations Identifying opportunities for the reuse of wastewater for productive use/protection of public assets - within development or adjustment to (ie productive use of peri urban agriculture)	**Meeting planning requirements** Supporting developers to meet obligations (ie stormwater management or waterway protection) required under Victorian Planning Provisions.
Meeting customer expectations Delivering on sustainability credentials - maximising use of all water sources.	**Property uplift/development opportunity** Increased sale price due to "water based development" providing greater returns on investment. Opportunity for higher quality development due to high quality drainage management.

Figure 7.5: Value of integrated water management planning and delivery for the water sector and developers/communities

Urban planning in Victoria is guided by many land-use policies, controls and regulations. Urban planning is closely linked to water management, as it determines the use of land on which water can be collected from various sources, stored and distributed to communities, as well as how much water will be used in the suburbs — and where (such as backyards, sporting ovals, streetscapes, commercial or industrial precincts and homes). Strengthening various planning tools by including integrated water management criteria will be critical to ensuring that water is factored into urban design. For example, the Victorian Planning Authority's Guidelines for Precinct Structure Planning in Melbourne's Greenfields will be updated to reflect current integrated water management criteria, standards and performance objectives (VPA, 2020).

Integrated water management is not limited to urban development. It can also contribute to high-quality and environmentally sensitive 'big builds'. One such opportunity is the construction of a third runway at Melbourne Airport, which requires significant volumes of water for dust suppression. The Victorian Government is working with the water sector to identify ways to supply recycled water for construction, which could save up to 3 gigalitres of drinking water over two years. The project could also unlock longer term opportunities to use recycled water to irrigate public open space and support peri-urban agriculture businesses, further reducing reliance on drinking water supplies along the proposed recycled water distribution system.

Further opportunities for integrated water management are explored in **Chapters 10** to **12**, including the development of outcomes-based targets in catchment-scale IWM plans outlined in **Chapter 11**.

Proposed direction 7-13:

- **The Victorian Government proposes to:**
  - **embed IWM objectives in major urban developments and infrastructure projects, to ensure that all sources of water, including stormwater and recycled water, are used in the landscape**
  - **require the use of IWM plans for land-use decisions on future developments and suburbs**
  - **explore ways to include IWM criteria in planning guidance material and policies.**

7.13 Implementation

The Victorian Government will work with water corporations, waterway managers, local governments, regulators and Traditional Owners on the directions proposed in this chapter, to encourage the more effective and affordable re-use of stormwater and recycled water — rather than relying on desalination alone to meet our growing water needs. This will ensure we have a range of viable options for new water supplies, and potentially help defer or even avoid major and costly infrastructure augmentations.

Water corporations will follow the guidance on these issues in the final Strategy and make decisions on the best mix of water sources for their particular systems. Options that are significant for the entire region will be progressed through the proposed Water Supply Readiness Roadmap, to be published in the final Strategy. For regional towns on local supply systems, the ability to use recycled water and stormwater more effectively provides opportunities to meet growing demands and increase the resilience of local supplies.

8. How we share and manage water

Image: Anglesea River, Anglesea, Wadawurrung Country

At a glance

- Over time, adding manufactured water to the region's supplies will bring opportunities to return some of the water corporations' river water entitlements to Traditional Owners and to the environment, while still maintaining the water entitlements required for agriculture.
- A new Unallocated Water Policy will guide the allocation of entitlements to the small volumes of water that remain available for allocation for consumptive purposes. This policy will make a portion of unallocated water available to Traditional Owners, provide for any critical urban security needs and make the remaining portion available to other water users via the market.
- The Strategy will strengthen monitoring and analysis, so that we can more accurately assess the local effects of water interception activities and infrastructure, such as plantation forestry and small catchment dams. This will build evidence for a better understanding of the benefits of interception, the quantities of water involved, and the cultural and environmental consequences.
- The region's water market will be made more effective by providing water users with clear and simple information, trialling an online water market exchange and investigating local opportunities to make trade rules more flexible.
- Clear decision-making and assessment criteria will guide the future opening of additional water storages for recreational purposes. This will enable the community to enjoy recreational activities on and around water storages, while preserving water quality, protecting public safety and operating storages efficiently.
- Victoria's licensing authorities will continue to manage our groundwater and unregulated water systems with an increased focus on monitoring and transparency of water use.

In Victoria, water is managed through an entitlement framework that provides clear and consistent entitlements that give users certainty on their access to water. Information on water availability, and tools such as water trading and carryover, give water users flexibility to respond to seasonal variability and the changing climate. The entitlement framework establishes who can access surface water and groundwater, and on what conditions, across the Central and Gippsland Region. But it is important to recognise that the entitlement framework was developed without the participation or consent of Traditional Owners, and therefore does not necessarily meet their aspirations or purposes.

Our current water sharing arrangements and water regulation have focused on using river water and groundwater, with recycled water and stormwater not considered as a resource until recently. As we move to using more manufactured water supplies, we need to consider how we will share both existing and new supplies between all users, including Traditional Owners, and whether changes to the entitlement framework are required in order to implement the directions proposed in this Strategy. We also need to make sure that the entitlements that establish how water is shared between those water corporations linked to the Melbourne supply system are suitable for the increasingly diverse mix of future water supplies.

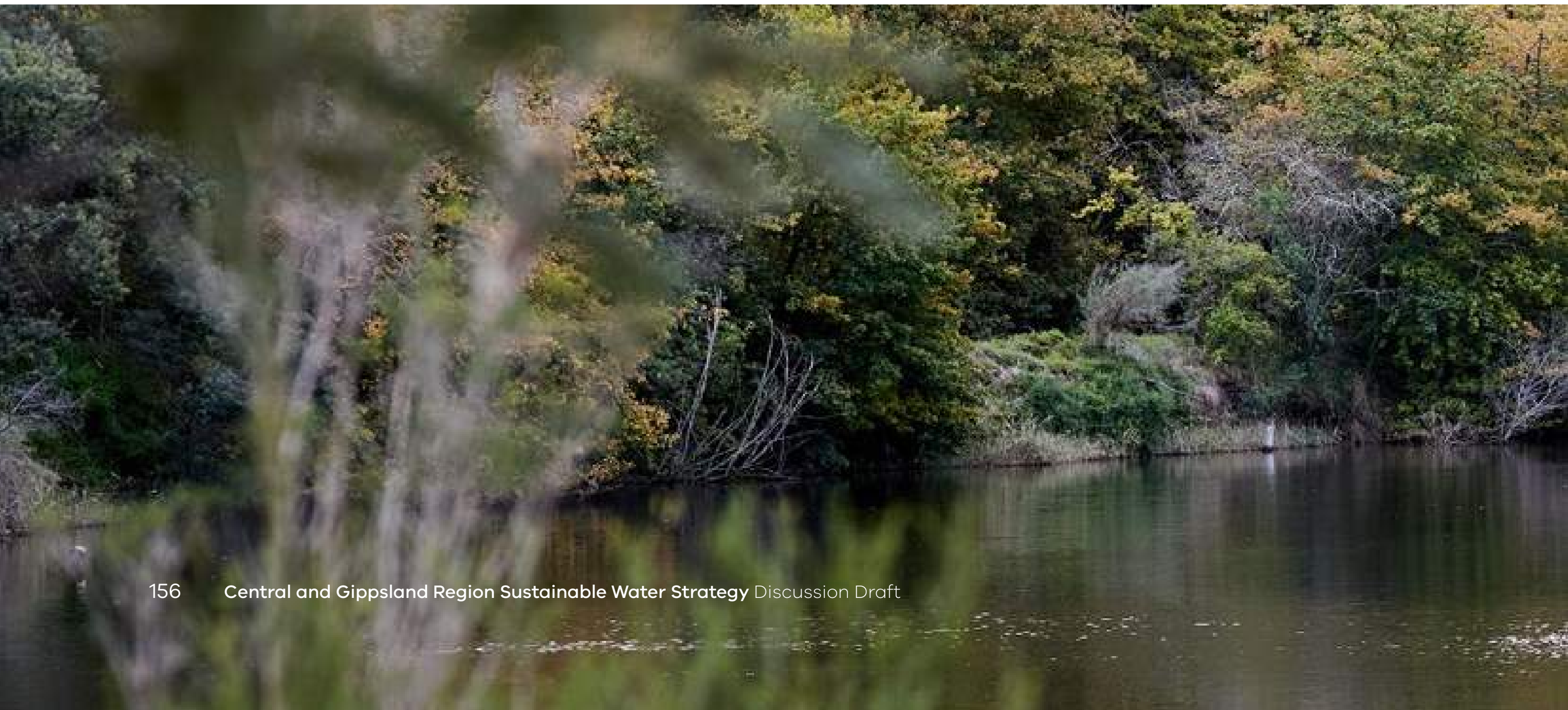
Under a drying climate, we need to make careful decisions about how to share the small volumes of water that have not been allocated to date, and how to take into account all uses of water, including a restorative justice approach to water for Traditional Owners, when making such decisions. Markets and trade will continue to play a role in allowing water to be shared between different uses in response to seasonal variability. We also need to find more opportunities to manage water in ways that provide benefits to many users.

What we have heard so far

Feedback provided during early consultation showed support for:

- balancing the many uses of water — domestic, industrial, commercial, agricultural, recreational — with healthy waterways and native plants and animals (95 per cent of responses to the online survey supported this)
- providing water for business and commercial needs in ways that offer the best value to industries that create job opportunities
- better promotion and communication of shared benefits such as environmental health and recreational opportunities
- improved recreational infrastructure to strengthen people's connections with waterways.
- there needs to be greater monitoring and transparency on all aspects of water use.

Image: Mitchell River, Bairnsdale, Gunaikurnai Country



8.1 Sharing new sources of water

Not all water sources can be used for all purposes (**Table 6.1**), but fit-for-purpose recycled water and stormwater can replace some existing drinking water supplies (from rivers or desalinated water) for uses such as flushing toilets, irrigating farms, gardens and sporting fields, and some industrial processes. Additional desalinated water supplies could free up a portion of existing river supply used for drinking via substitution — when, by agreement, the right to draw on one source of water is replaced by the right to another source. Such substitution arrangements will free up water to meet future consumptive or other demands, including returning water to the environment or Traditional Owners. **Figure 8.1** shows some examples of how substitution could be used at the local scale and across the region.

Substitution arrangements across the region are possible because of the Victorian water grid's greater connectivity. Nevertheless, consultation with existing entitlement holders and future water users is required to determine — on a case-by-case basis — whether substitution is acceptable. The detailed assessment of options, including discussions with relevant parties, will be part of the 'readiness' stage of the Water Supply Readiness Roadmap, as detailed in **Chapter 6**.

Through this draft Strategy, the Victorian Government sets out its proposed approach for sharing new, climate-resilient water sources — an approach that considers the suitability of water for different uses. Opportunities to meet many needs will also be considered, including freeing up water in rivers to contribute to meeting environmental water recovery targets and to return water to Traditional Owners.

The proposed Water Supply Readiness Roadmap will identify priority opportunities for water substitution as new, climate-resilient supplies are brought online, and will include the return of a proportion of the volume substituted as water entitlements to Traditional Owners on the completion of these projects. The specific sharing arrangements will be based on a quadruple-bottom-line analysis that takes into account the investors in a given project, as well as the social, cultural, environmental and financial costs and benefits. For projects that have undergone this analysis and whose sharing and funding arrangements have been agreed on, the Roadmap will specify a percentage share to be made available to the Traditional Owners, the river(s) in which the water entitlements will exist and the timeline for completing the project.

Proposed direction 8-1:

- **The Victorian Government proposes to balance the needs of different water users in the region by developing and investing in new, climate-resilient water supplies for consumptive uses and using substitution to match uses to sources that are fit for purpose. This will enable more water to be retained in rivers to meet many needs, noting that water substitution arrangements that return water to Traditional Owners and the environment will not reduce water availability for farmers.**

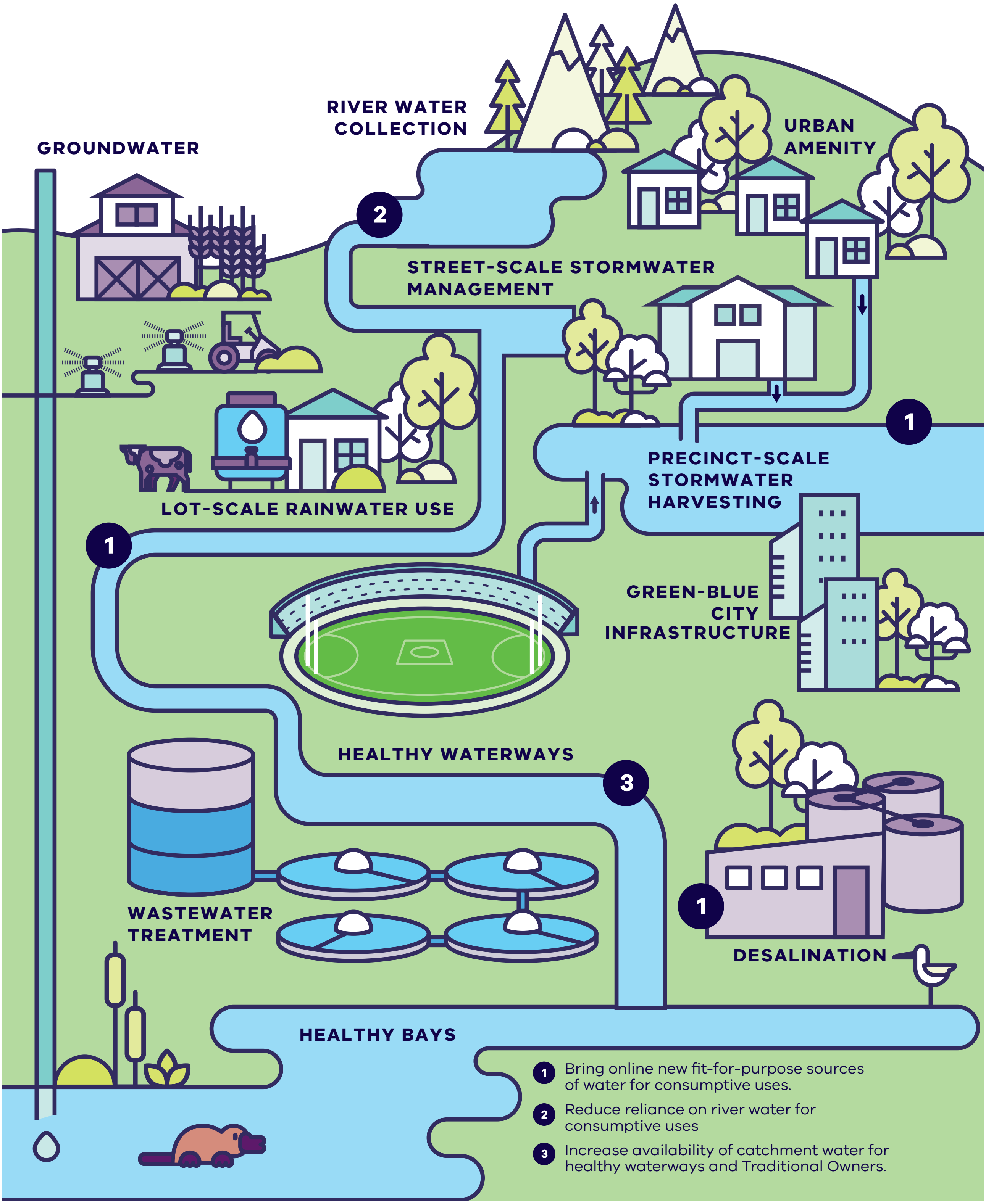


Figure 8.1: Example of substitution where one user has needs met from other uses and values accessing new sources of water

8.2 Entitlements for Traditional Owners

Traditional Owners have never ceded rights to water across Australia, yet Aboriginal people own less than 1 per cent of water rights. This exclusion denies Traditional Owners the right to care for Country, which is the essence of Aboriginal social, spiritual, economic and physical wellbeing, and the basis of cultural lore. The cultural responsibility to care for Country has also been denied through the exclusion of Traditional Owners from water policy, management and planning in Victoria. This has severely damaged the health of Country, and the health and wellbeing of Traditional Owners, and contributed to unsustainable water management practices, which affect everyone.

A restorative justice approach considers these historical injustices and seeks to repair that harm; the best way to do that is for Traditional Owners to lead the process and determine how transformation can be best achieved.

Section 8A of the *Water Act 1989* provides a right for Traditional Owners to take and use water under certain restricted circumstances, but these rights have never been exercised. The provision applies only to groups with an agreement under Victoria's *Traditional Owner Settlement Act 2010*. Such an agreement does not currently apply to any Traditional Owner groups covered by the Central and Gippsland Region Sustainable Water Strategy. In addition, the application of water under the section 8A provisions of the Water Act is very limited.

Under the Water Act, Traditional Owners can be issued with entitlements to surface or groundwater as a section 51 take-and-use licence, which is an accessible form of water entitlement for Traditional Owners now. However, section 51 take-and-use licences may not serve all use purposes and the Department of Environment, Land, Water and Planning will continue to work with Traditional Owners across the state to identify further ways to support water for Traditional Owners, including potential options to amend legislation in future. The Victorian Government will return water to Traditional Owners where there are opportunities to do so in the near term as section 51 licences since changes to legislation will take considerable time to develop and seek agreement on. Access to more appropriate forms of water access entitlements is necessary to support healthy Country and healthy mob, including access that is ongoing and protected. Adequate funding and resourcing of Traditional Owners to manage water entitlements that are returned also needs to be resolved.

This Strategy will play a leading role in returning water to Traditional Owners in the region, under the existing legislation. The Victorian Government will continue to work with Traditional Owners to determine their best avenues for securing water for the various purposes in the scope of 'traditional uses', and for emerging commercial uses. This includes developing options for the entitlement framework to better support Traditional Owner needs.

Image: Black swan, Sale Common, Gunaikurnai Country

Proposed principles to guide allocation of water to Traditional Owners as it becomes available

- Traditional Owners will receive entitlements to water in rivers and aquifers on Country for their self-determined use. Where a water source is shared between more than one Traditional Owner, rights to that water source (for example a river or aquifer) will be equally shared.
- Where more than one party has an interest in water entitlements to particular rivers and aquifers (unallocated water, and previously allocated water that can be re-allocated), Traditional Owners will receive a share of the water entitlements equitable with the shares of other interest groups.
- The share of unallocated water returned to Traditional Owners should be allocated as a matter of priority (without waiting for other shares to be allocated via auction processes or similar).
- Water substitution arrangements that free up water in rivers for Traditional Owners should be pursued in water systems on the Country of each Traditional Owner.
- As new water supplies are built (such as recycled water systems and desalination plants), Traditional Owners will have access to a share of these new supplies, directly or via substitution for river water. The share will be determined on a case-by-case basis with the relevant Traditional Owners, taking into consideration the restorative justice approach of the Strategy.

Proposed direction 8-2:

- **The Victorian Government, in partnership with Traditional Owners in the region, will apply the principles proposed to allocate water to Traditional Owners as it becomes available.**

Image: Buckley Falls, Highton, Geelong, Wadawurrung Country

8.3 Entitlements and market arrangements for urban water corporations

Victoria's urban populations are concentrated in the South-Central Region, which includes Melbourne and the surrounding areas of Geelong, Sunbury, the Mornington Peninsula and parts of Gippsland. Urban areas in this region are supplied with water through a system of connected rivers and dams, and the Victorian Desalination Project, which are all part of the water grid (**Figure 2.4**).

As we continue adding more manufactured water supplies (desalination and recycled water) to the Melbourne supply system, the entitlements stipulating who can use which sources of water and under what conditions will need to be updated.

Each of the seven urban water corporations in this region holds entitlements to water from rivers and storages in the Melbourne supply system.[14] However, only the three metropolitan water corporations have entitlements for desalinated water.[15]

In practice, all of the connected communities benefit from the security that the desalination plant provides and adding new supplies as separate entitlements in the future will likely result in unwieldy sharing arrangements.

Because most major cities and towns in the region are connected to the water grid, it is important to share water fairly and give water corporations flexibility to adjust to changes in the environment and the communities that they serve, including trading between each other as required to reflect their changing circumstances. While feasibility assessments have revealed the absence of the fundamental conditions for an effective urban water market in south central Victoria, we will continue to support current arrangements. This will provide urban water corporations flexibility by allowing them to buy and sell water from each other, without expansion of the market.

The Department of Environment, Land, Water and Planning will work with urban water corporations to consider potential reform to urban bulk water entitlements in the Melbourne system to:

- better recognise that all the connected towns benefit from access to desalinated water;
- better reflect future water availability;
- simplify the process for adding new sources to the connected system; and
- bring greater transparency to the sharing arrangements over time.

Any reform will be supported by transitional arrangements to ensure a smooth changeover that keeps customer impacts to a minimum.

14 The seven urban water corporations are Barwon Water, Greater Western Water, Yarra Valley Water, South East Water, Westernport Water, Gippsland Water and South Gippsland Water.

15 The three metropolitan water corporations are Greater Western Water, Yarra Valley Water and South East Water.

8.4 Distributing unallocated water

Explaining water caps

There is a limit, or cap, on how much water can be taken from waterways and groundwater systems in the Central and Gippsland Region (**Figure 8.2**). Water above this cap is retained in rivers or aquifers to support waterway health and other water rights that do not require formal entitlements.[16] Water under the cap can be allocated to users through the entitlement framework. Unallocated water is water that can still be issued under the cap for a given purpose or use.[17] In 2011, the Gippsland Region Sustainable Water Strategy and Western Region Sustainable Water Strategy identified small volumes of unallocated river water at a few locations in the region, and recommended the continued use of a market-based process for distribution when demand required it.

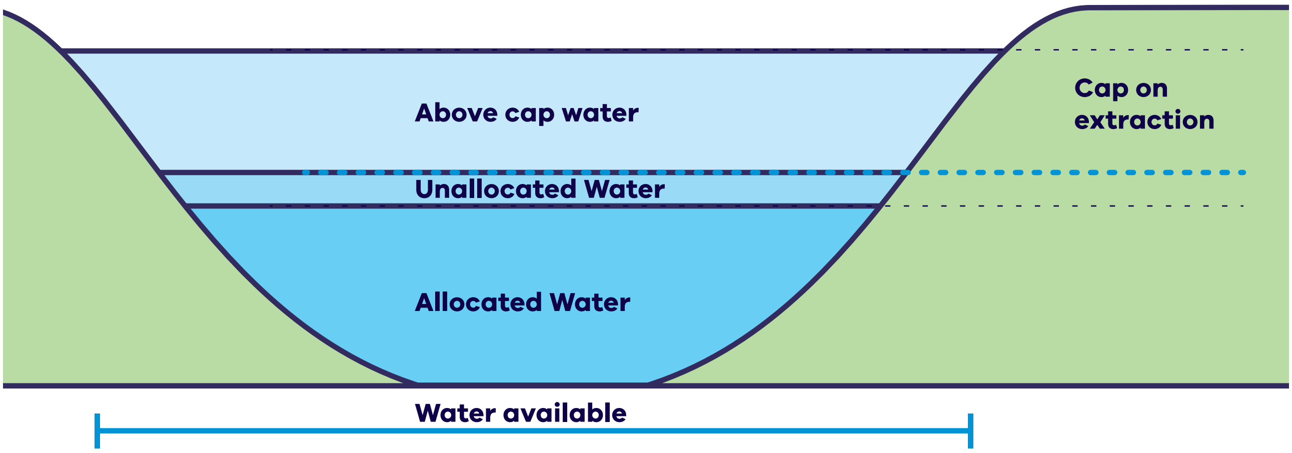


Figure 8.2: Concept of unallocated water and water caps

Market processes for distributing unallocated water may not provide equal opportunities for all potential uses to be considered and prioritised, as water would go to parties that are best resourced to pay for it. Capacity to pay will not always reflect the greatest need or greatest benefit to a region. For example, Traditional Owners may have limited resources to purchase water entitlements; businesses and communities that benefit from healthy waterways may not have the resources or institutional structures to purchase water entitlements for environmental, recreational, tourism or water-quality benefits.

The Victorian Government is proposing to set out the way in which future decisions on unallocated water will be made, in order to balance the needs of all water users. This Unallocated Water Policy will provide a clear and consistent process, which is important for transparency in decision-making and greater certainty to users who wish to access this water in the future.

Any decisions about the distribution of unallocated water must be made in a way that ensures the long-term sustainability of the resource — including protection of existing entitlements. It is also important to consider how the policy will practically apply in different types of systems, including regulated and unregulated surface water systems and groundwater systems.

16 In the Central and Gippsland Region, caps are set through permissible consumptive volumes and winterfill sustainable diversion limits.

17 This definition of unallocated water does not include water in existing entitlements that is under-used or may become available via trade or re-allocation, water in unincorporated groundwater areas, stormwater, recycled water or water generated through investment in water efficiency infrastructure.

It is proposed that an Unallocated Water Policy would include in its decision-making process the distribution of a portion of local unallocated water to Traditional Owners, and a portion to meet other consumptive demands, including urban water security, agriculture and industrial uses.

Because the level of interest in unallocated water will vary, the policy will include an implementation process, which includes working with Traditional Owners.

Decision-making process for unallocated water

It is proposed that future decisions about distributing unallocated water will be made by following the three steps shown in **Figure 8.3**. These steps need to be further defined to clarify roles and responsibilities for decision-making.

Before a water resource is allocated, its sustainability must be confirmed. This would require an assessment of whether there is water available that could be allocated without reducing the sustainability of the resource or impinging upon existing water entitlements, including environmental water.

The next consideration should be the priority allocation of a proportion of available water to Traditional Owner needs, and urban water security to meet critical human needs (where applicable). There would be no need to allocate a proportion to the environment, because its needs would already have been considered in the first step, which confirms the sustainability of the resource. The limit, or cap, on how much water can be taken would determine the environment's share.

The balance would be made available on the open market, to meet any demand for other uses, including agriculture and industry.

STEP 1:
Confirm sustainability of the resource

STEP 2:
Release and distributed between:

- urban water security (if applicable)
- Traditional Owners
- undelivered actions from a SWS (if applicable)

STEP 3:
Release balance via open market

Figure 8.3: Proposed decision-making process for unallocated water

Returning water to Traditional Owners in the Mitchell River

The proposed decision-making process for unallocated water builds on recent decisions about distributing unallocated water in the Mitchell River. A total of 6 gigalitres of unallocated water was identified in the Gippsland Region Sustainable Water Strategy in 2011. The Gunaikurnai Land and Waters Aboriginal Corporation has recently received a 2-gigalitre share through formal allocation under a section 51 licence for cultural water. A further 2 gigalitres was released to market by Southern Rural Water in early 2021, with the final 2 gigalitres yet to be released to market.

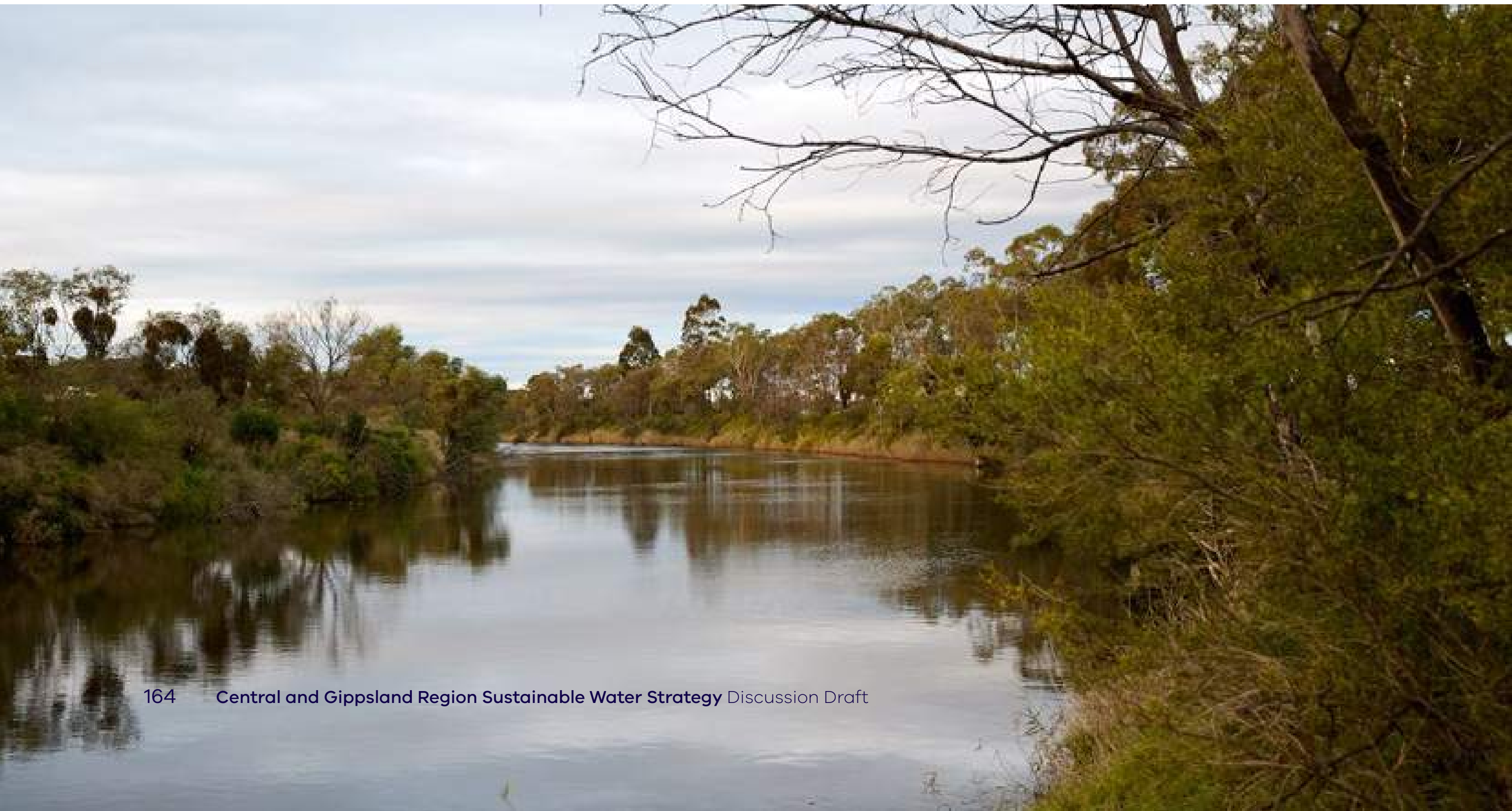
Proposed direction 8-3:

- **It is proposed that the Victorian Government develop an Unallocated Water Policy that balances the needs of all water users (based on the process shown in Figure 8.3). This will implement government's commitment to provide access to water for Traditional Owners by making a portion of unallocated water available to Traditional Owners, make provision for any urban water security needs, and make remaining water available for consumptive demands.**

8.5 Managing interception activities

In a drier future, we need to consider managing the impact of all types of water uses, including those that are not part of the water entitlement framework. Interception activities are land-use changes — such as small catchment dams and plantations — that can have a material effect on water resources, but do not require a water licence. The volumes of water intercepted by small catchment dams and plantations are significant in some parts of the region. The Victorian Government will seek to balance the needs of these interception uses and the repercussions of their unconstrained growth on

Image: Mitchell River, Bairnsdale, Gunaikurnai Country



other water values and uses. Monitoring and a better understanding of the broader benefits and costs will support any future decisions to manage growth. Small catchment dams and plantations are the only significant interception activities in the region that need consideration in the Strategy.

Urbanisation generates additional run-off from the increase in impervious surfaces (such as roofs, roads and footpaths). These surfaces intercept water that would otherwise have infiltrated into groundwater, but also increase stormwater run-off, which generally results in a net increase in water reaching local waterways (albeit with significant changes in timing and quality). Stormwater is considered further in **Section 2.5** and **Chapter 7**.

Small catchment dams

Across the Central and Gippsland Region, there are about 146,000 small catchment dams (sometimes referred to as domestic and stock dams), with an estimated total volume of about 104 gigalitres. Under the Water Act, a licence is not required to use water from small catchment dams for domestic and stock purposes, and there are no limits on the number of such dams that can be built.[18]

Small catchment dams form a significant part of rural landscapes and can provide many benefits to dryland farmers, including drinking water for livestock, fire protection, water for gardens, recreation and aesthetic purposes. However, the cumulative impact of small catchment dams in a catchment can have significant effect on water downstream. For example, small catchment dams intercepted an estimated 11 per cent of the Maribyrnong catchment's inflows in 2018–19. This is water that otherwise would have flowed into downstream rivers, dams and into groundwater. Further growth in the number of small catchment dams has the potential to deplete water supplies that other users and the environment depend on. While in some cases small catchment dams can provide a drought refuge for wildlife, which has environmental benefits, their net effect on the environment is harmful.

Analysis of aerial photography suggests that the highest rate of growth in the number of small catchment dams was during the Millennium Drought, when landholders sought to secure their water resources. As peri-urban lots were subdivided, the number of dams increased to serve new properties. This might happen again if Victoria were to suffer another long-term drought.

While climate change is impacting the volume of water captured in small catchment dams across the region, these dams tend to be more resilient to dry conditions as they are usually located in the upper catchment and get the first run-off when rainfall events occur. The location in the catchment and landscape, the design, construction and the ongoing management of small catchment dams and other water infrastructure on farm influences water-use efficiency, the benefits and impacts on environment, quality of stock drinking water, fire protection and drought preparedness. Further work is needed to increase our understanding of the complex economic, social, cultural and environmental factors associated with small catchment dams and the role of small catchment dams in the broader system in the context of climate change and reduced water availability.

While evidence indicates a high likelihood that the cumulative effects of small catchment dams are contributing to declines in surface water availability in some catchments, the exact nature of these effects remains unquantified. Options for controls are yet to be explored, and would require a thorough analysis of their effectiveness, cultural and environmental costs and benefits, and socio-economic consequences, including repercussions for the dam owners' water security.

To manage the region's long-term water needs, the Victorian Government will seek to balance the needs of small catchment dam users and the effects that unconstrained growth could have on other water needs. The Department of Environment, Land, Water and Planning will develop a framework for monitoring risks to water supply and security from cumulative growth in the number of small catchment dams, focusing on areas with a high density of dam development (hot spots), while also keeping track of emerging hot spots.

18 Although the Water Act provides no mechanisms to manage growth in this type of intervention, small catchment dams that are directly on a waterway or that are used for commercial purposes do require a licence under section 51 for the take of water. A dam that is on a waterway or that is classified as hazardous (dam wall above 4 metres in height) requires a works licence under section 67 of the Water Act.

Measures to manage the growth in the number of small catchment dams would need to be developed in close collaboration with communities, and applied in locations where their impacts on high-value downstream environmental or consumptive values are very apparent.

Proposed direction 8-4:

- **The Victorian Government proposes developing a monitoring framework for identifying emerging risks to water resources, investigating hot spots, and developing community-led management options to respond to risks resulting from the cumulative growth in small catchment dams. The framework should consider the broader economic, social, cultural and environmental priorities, benefits and costs to the region.**

Plantations

Plantation forestry is one of many important economic activities in Victoria. The growth, management, harvesting, haulage and processing of plantation timber create jobs and economic activity across the state, particularly in regional areas. Plantations are also valued for their carbon sequestration and are playing an increasing role in reducing greenhouse gas emissions, through carbon offsets (McPherson *et al.*, 2005).

Large-scale changes to land use, such as the establishment of plantations, can increase the amount of water intercepted and reduce water availability downstream. When trees replace pastures, grasslands or native woodlands, they take up water that would otherwise reach rivers, reservoirs and aquifers, and can also extract water directly from shallow aquifers. New plantations consume more water than do mature plantations, and the cycle of water use associated with tree growth is repeated as plantation areas are harvested, fallowed and re-established. The effect of water interception by plantations is greatest during dry periods, when trees take up a greater proportion of available water.

Although trees use more water than do grasslands or pastures, they have many benefits for waterways, including reducing erosion and siltation, improving water quality, managing dryland salinity and reducing water temperatures through shading.

Nevertheless, timber harvesting and replanting can impact on water quality and river health. Appropriate planning and management through the entire life cycle of the timber production operation can minimise these impacts and are regulated under Victorian Government regulations administered by local government.

Water take from plantations is not included in Victoria's entitlement framework or managed under the Water Act. Thus, an increase in plantation water use can have an impact on downstream users, Traditional Owners and the environment, and must be taken into account in future decisions on water management and entitlements. The effects of climate change on water availability may exacerbate the impact of plantations on downstream users as the trees use more water and further increase competition for water.

We need to better understand the complex economic, social, cultural and environmental factors associated with plantations. In addition, further information is required on the role of plantations in intercepting water, particularly in the context of climate change and reduced water availability. This must be considered alongside the changing needs, priorities and risks of all water users, and the broader benefits and costs that underpin community expectations on water use. Such evidence will be the basis of future decisions on the sustainable management of the region's water resources.

Proposed direction 8-5:

- **The Victorian Government proposes to develop a comprehensive evidence base on plantations that includes the broader economic, social, cultural and environmental benefits and costs associated with plantations, alongside technical information on the effects of plantations on streamflows and groundwater recharge.**

8.6 Better information and market tools for rural users

Victoria's water markets allow farmers, environmental water holders, water corporations and other users to buy and sell water entitlements, allocations and licences, so that they can manage their risks according to their willingness to pay. This allows people to share the benefits of water in ways that are equitable, responsive and transparent.

In the Central and Gippsland Region, arrangements do not generally facilitate movement of water across catchments, which means that people need to use water sourced within their own region. Some people are already trading water to manage their risks and get the most out of their water, and we are looking to increase the opportunities for trade to support resilient and sustainable farming businesses.

Water trade is more difficult in smaller and developing markets, because buyers and sellers struggle to find each other and determine a fair price in a market where there are very few transactions. This means that people often hold water that they do not eventually use for production, while others dry off parts of productive land as they cannot obtain the additional water they need for irrigation.

The water markets in southern Victoria are unlikely to reach the level of development seen in the north, where connected and regulated systems that encompass a broad range of crops and sub-regions support high levels of trade. However, there are real opportunities to create additional flexibility and value for farmers and other rural water users in the Central and Gippsland Region by providing clear, easily accessible information about water, improving water market transparency and making it easier to buy and sell water.

It is important to recognise that changing what people can do with their water may also affect cultural values in catchments and limit the ability of Traditional Owners to fully benefit from water they hold now and in future. We will work closely with Traditional Owners as we investigate reforms to water trade.

The Victorian Government is already working to help farmers and rural water users realise the benefits of water markets by:

- **providing clear information about water** — we are already working on providing more timely and accurate information about the availability of water, water management rules across catchments, and water markets. To make it easier for people to find out what they can do with their water, the Victorian Government is developing simple and clear information about water management, trade rules and water availability in the region that can all be found in one place.
- **improving water market transparency** — we can do more to help people trade with each other in a fair, transparent and efficient way. To investigate the best way to help water users in southern Victoria get the most out of their water, we are proposing to trial an online water trading exchange in the Macalister Irrigation District. This will help buyers and sellers find each other more easily, improve transparency of trade prices, increase accuracy of price reporting and make trades more efficient.
- **making it easier to buy and sell water** — with many relatively small and disconnected water systems in the region, many of which are unregulated, there are currently restrictions on where and when water licences can be traded. This is intended to protect rivers from over-extraction and prevent harm to the environment and disadvantage to third parties.

We know that there could be opportunities for licence holders to increase their flexibility by being able to trade water a short distance upstream, where risks to the environment and others are low, or by trading between local regulated and unregulated systems.

Proposed direction 8-6:

- **The Victorian Government proposes to help farmers realise the benefits of water markets in the Central and Gippsland Region, and get the most out of their water.**

This could be achieved through a combination of:

- publishing clear and simple information about water management rules, trade rules and water availability across southern Victoria — all in one place
- trialling an online water market exchange that helps buyers and sellers find each other and trade in a fair and efficient way
- investigating local opportunities to make water trade rules more flexible where disadvantage to other people and harm to the environment can be minimised.

8.7 Passing flows

A passing flow is the minimum volume of water that must be allowed to pass a reservoir or diversion weir before water can be extracted for later use. Passing flows can provide many shared benefits, including:

- protecting Traditional Owner cultural values, such as aquatic species of cultural value
- providing water for other downstream uses, such as stock and domestic use
- providing water for the environment, such as continuous flows through summer that protect refuge pools for platypus, fish and macroinvertebrates
- protecting other public values associated with healthy waterways, such as recreational opportunities
- maintaining water quality downstream.

At many locations across the region, passing flows have declined, predominantly due to a drier climate and declining inflows at reservoirs and diversion weirs. Most rules on passing flows were designed more than two decades ago, and many do not consider the effect of maintaining passing flows under a drying climate. For example, reduced inflows to Lal Lal Reservoir due to a drying climate have triggered a reduction of passing flows more often than was intended under the existing rules.

The Victorian Government is evaluating ways to optimise passing flow rules at targeted sites across the region where there are limited options for recovering water for the environment. At some locations it may be possible to amend the passing flow rules to provide shared benefits for the environment, Traditional Owners, stock, and domestic and recreational users, without disadvantaging existing entitlement holders. For example, by allowing more water to be extracted and stored during winter it may be possible to let more water pass downstream of a reservoir or weir during summer, thus avoiding extended low-flow periods that threaten environmental values.

Passing flow rules will only be amended where the benefit of the change can be clearly demonstrated, the integrity of existing water rights and entitlements is maintained (or impacts mitigated), and relevant entitlement holders, Traditional Owners and catchment management authorities have been consulted.

8.8 Management and compliance of water extraction in unregulated rivers and groundwater systems

Water entitlements in groundwater and unregulated water systems are facilitated by take and use licences as per section 51 of the *Water Act 1989*. Licences are issued in consideration of the matters outlined in section 53 and section 40 of the Act to ensure that there are not unacceptable adverse impacts on the environment or third parties. The Minister for Water has delegated this responsibility to licencing authorities (e.g. rural water corporations) who issue licences in line with the responsibilities of the Act and the *Ministerial Policies for Managing Take and Use Licences*. In the Central and Gippsland Region licencing is managed by Southern Rural Water and Melbourne Water (surface water only in their surface areas).

A person or corporation may apply to take water from our rivers and groundwater, however, applications for a licence volume will only be considered under specific circumstances:

1. *Where there is unallocated water within the system* – a licence and allocation to access water can be issued consistent with the Act's requirements and the Victoria's unallocated water policy (see **Section 8.4**).
2. *As a result of a trade* – the trade may change the point of take but not the overall volume of water allocated or extraction from the system.
3. *If the water is within a stormwater asset* – the asset must be managed and owned by an Authority or in an urban waterway downstream of a stormwater asset under specific rules (see **Section 7.8**).

New take and use licences issued for unallocated surface water may also be subject to other rules, including take being limited to specific periods (e.g. winter months only) and like all licences will be subject to restrictions or bans on extraction during periods of low flow. In most circumstances the extraction will also require an approved works licence to ensure the method of water extraction is appropriate.

For both surface water and groundwater systems, access for domestic and stock use is permitted in line with the purposes in the Act. Groundwater access requires a works licence (commonly referred to as a section 67 licence) to ensure that the bore is constructed in a way that protects the integrity of the aquifer. There are also restrictions on the type of works that can be used to extract water for domestic and stock purposes from a waterway.

The main focus of licensing authorities within the Central and Gippsland region is overseeing the take and use of water by all licensing holders within a system. This includes: monitoring the condition of the water resource; the implementation of rosters, restrictions and bans during periods of water shortage; and compliance and enforcement activities (e.g. monitoring take of water inconsistent with licence conditions). Rosters, restrictions and bans are communicated through local management plans developed by licensing authorities, or through statutory management plans that are issued by the Minister and enforced by licensing authorities.

With very few exceptions, which are outlined in the Act, section 51 take and use licences can only be issued for a maximum of 15 years. When renewing a licence, which can be done before they expire, licensing authorities must consider the same matters as when issuing a licence. licensing authorities may add, amend, or remove conditions.

Licensing authorities are responsible for risk-based compliance strategies under the *Non-urban Compliance and Enforcement Guidelines for Water Compliance* based on the level of risk to the resource in providing consistent and reliable water availability and delivery and the risk of a breach.

Proposed direction 8-7:

- **The Victorian Government proposes to work with licensing authorities to ensure that the licensing management framework is understood and that information (e.g. caps on the volume of allocations in a system) is available and consistent with new compliance and regulatory requirements. These requirements and expectations of the State's proposed unallocated water policy will be reflected in updates to the *Ministerial Policies for Managing Take and Use Licences.***

Image: Lake Guthridge, Sale, Gunaikurnai Country

8.9 Providing shared benefits

Water managers can be innovative in the way they meet environmental or social benefits without requiring additional water. The Victorian Environmental Water Holder works with waterway managers and Traditional Owners to maximise the shared benefits of environmental water releases, and this needs to continue. While Traditional Owner values have started to be considered through environmental water, there is still much work required. More can also be done to meet environmental and social benefits when we store and deliver water for consumptive use.

Bolin Bolin Billabong

Significant benefits for Traditional Owners can be achieved through environmental watering — whether by directly sustaining healthy Country and totem species for communities, or by enabling cultural activities to take place. In 2017 the Victorian Environmental Water Holder, in partnership with Melbourne Water, delivered environmental water to Bolin Bolin Billabong, next to the Yarra River at Bulleen. The watering was endorsed by the Wurundjeri Woi-wurrung Traditional Owners, who have strong cultural connections to the billabong. Data collected during the watering, along with the traditional knowledge of the Wurundjeri Woi-wurrung, will inform future management objectives and practices.

Proposed direction 8-8:

- **The Victorian Government proposes to work with water corporations, catchment management authorities and Traditional Owners to explore opportunities to deliver shared benefits — including through recreation — through the management of water supply systems and waterways.**

Environmental water releases can be planned and timed to support social and recreational values of waterways. Healthy waterways support healthy fish populations, which in turn support recreational fishing. Improved water quality provides opportunities for water-based recreation such as kayaking. The presence of native flora and fauna is enjoyed by recreational users.

Recreational values are currently considered when making environmental watering decisions. For example, West Gippsland Catchment Management Authority adjusts the timing of environmental flows to optimise opportunities for kayaking (where this does not reduce environmental benefits). Storage management and river operation decisions made by water corporations can also support recreation. For example, Southern Rural Water manages Lake Narracan so that water levels are adequate for major waterskiing events between December and April each year.

The Victorian Government recognises the importance of recreational uses of our waterways and storages and the enjoyment and wellbeing benefits they provide for the community. These benefits need to be considered in decision making about uses of our water storages. Community groups such as recreational fishers want greater access to reservoirs in the region. In developing proposals for this, it is important to preserve drinking water quality, keep visitors safe, and protect Aboriginal cultural heritage and environmental values. While a number of storages in the region provide opportunities for recreation, others — such as those in closed catchments — are closed to recreation in order to protect water quality and security.

Clear guidance is needed for recreational access to water storages, to provide certainty for recreational water users, the water sector, Traditional Owners and the wider community. Decisions need to consider the often significant community benefits of access as well as the, costs, and necessary protections for water quality. Clear guidance will help the water sector collaborate with communities to develop proposals that are sufficiently robust for funding consideration.

Proposed principles to guide decisions on recreational access to water storages

- Opening up access to storages for recreational use will be considered and prioritised where the recreational benefits are the greatest and outweigh the costs
- New recreational access proposals must articulate:
  - the facilities and infrastructure required to support access in a way that is safe for the public, maximises enjoyment and takes into account the following considerations.
  - how drinking water quality and human health will be protected
  - the extent of Traditional Owner support, and any considerations for the protection of cultural values
  - any measures necessary to protect environmental values
- Proposals need to demonstrate how the community will benefit, through a robust cost–benefit analysis.
- Investment decisions will ultimately be made on the basis of the above information, where the benefits outweigh the costs and any risks to water quality can be managed. Cost-sharing arrangements will be agreed as part of the investment decision and will take into account the relative beneficiaries of the project
- Water corporations will report annually on work programs to increase the recreational value of water storages.

Proposed direction 8-9:

- **The Victorian Government proposes to apply the principles outlined above when deciding whether to open water storages for recreational use.**

Infrastructure such as boat ramps, toilet blocks, walking trails, fishing platforms and picnic areas encourages enjoyable, safe and environmentally sustainable recreational experiences. Water corporations, catchment management authorities and Melbourne Water provide infrastructure and facilities to facilitate recreation at sites they manage, and work cooperatively with other land managers, councils and the Victorian Government to help guide their investment in recreational assets along waterways.

There is an opportunity to work more closely with Traditional Owners to improve access and facilities at priority areas for Traditional Owners. For example, many traditional fishing and swimming areas are now not traversable, due to overgrown pathways and bank changes. In addition, developing site plans in partnership with Traditional Owners can improve protection of sites of tangible and intangible cultural significance, for example by directing fishing, boating or camping away from these sites.

9. How we invest to secure our water supplies

Image: Thompson Reservoir

At a glance

- Significant investment in new water supplies is needed over the coming decades to meet the challenges of population growth and climate change.
- New water supplies can provide benefits beyond the supply of water to cities and towns, including improving water reliability, returning water to Traditional Owners, and improving waterway health for environmental and recreational benefits.
- In recognition of the potential for these public benefits, proposed guidelines will clarify when Victorian Government co-investment in new water supplies can be considered.
- Staged and carefully planned increases in water supplies will lead to efficient investments that maximise the benefits and minimise impacts to households.
- This Strategy will not directly affect water prices. Any future price changes will require community consultation by water corporations and approval from Victoria's independent price regulator, the Essential Services Commission.
- A decision making framework for investment that reflects the importance of affordability and stability for water users is proposed.

We know that we will need to bring on new water supplies in future to meet demand in a drying climate, and that this will require significant investment. This draft Strategy proposes to do this in a staged, well-planned way, so that the best option is selected for investment at a given time, based on an assessment of financial, cultural, environmental and social costs and benefits. This will be essential if we are to realise the proposed vision for the region to:

Ensure our waterways and aquifers can support a healthy environment and regional prosperity for current and future generations, where the water needs of our cities and towns, Traditional Owners and the environment are met — even as the climate becomes drier and more variable — and where agricultural, industrial and recreational activities can thrive.

By planning and investing efficiently and providing adequate support for vulnerable water customers, a secure water future for the Central and Gippsland Region is achievable and affordable. Future investment decisions should be made in line with the principle of keeping water bills affordable and as stable as possible. The proposed directions in this draft Strategy will ensure that we get the best value out of each investment, and will foster a resilient and secure water future for the waterways, aquifers, Country and people across the region for current and future generations. Proposals include investing in smarter, integrated water management projects so that, despite drying conditions, we can maintain healthy urban waterways and green, liveable cities and towns.

What we have heard so far

Feedback provided during early consultation showed support for developing a pricing regime that supports:

- affordability, particularly for disadvantaged members of the community
- a mix of diverse and manufactured sources of water
- better water use.

9.1 Funding implementation of the final Strategy

The implementation of the final Strategy will require significant investment over coming decades to secure water supplies across the region. Most actions in the final Strategy, unless they can be funded under existing arrangements in the Department of Environment, Land, Water and Planning or its delivery partners, will be funded via business cases that feed into future investment decision-making of government and water corporations. Further details on funding, including for Traditional Owner actions, will be set out in the Implementation Plan for the final Strategy (**Chapter 13**). The remainder of this chapter focuses on the proposed arrangements for funding future major water infrastructure projects, which will require detailed business cases and analysis.

9.2 Sharing the costs

In most circumstances, water corporations use funds raised from customer water bills to invest in essential infrastructure. Victorian Government co-investment is available only where a business case demonstrates that the project will provide net public benefits and where funding is available in a given state budget. The case for government investment in water infrastructure is growing as Victoria feels the effects of climate change: drying conditions, and more severe storms, bushfires, droughts and floods. To provide greater clarity to water corporations and water users, and help plan for future investments, the Victorian Government proposes to develop principles and guidelines for co-investing in water infrastructure. This includes projects to grow urban water supplies, expand or upgrade rural water infrastructure, and re-use stormwater and recycled water. The principles would build on the existing principles for rural water infrastructure shown in **Table 9.1**.

Victorian Government co-investment (where applicable) would be considered on a case-by-case basis and could include infrastructure funding or funding to support vulnerable customers. Decisions on Victorian Government co-investment will be informed by feedback from the community and water industry as part of the business case for each project. Commonwealth funding will be sought for eligible water infrastructure projects, for example via the National Water Grid Authority.

Proposed direction 9-1:

- **The Victorian Government proposes to develop and publish principles for public investment in water infrastructure projects. Table 9.1 below shows the proposed basis of the new principles.**

Proposed direction 9-2:

- **The Victorian Government proposes to develop additional guidance for public investment in specific types of projects, such as stormwater and recycled water infrastructure, as required.**

Table 9.1: Principles for public investment in rural water infrastructure projects, subject to available funds (source: DELWP, 2016, Table 4-1)

Long-term viability	• Net benefits will be achieved under a range of future water availability scenarios • User demand and support for the proposed service is demonstrated, including commitment to meet all future operation and maintenance costs, and costs to source water through the new infrastructure • It is consistent with regional strategic plans, regional growth plans, regional catchment strategies and land-use planning • It is consistent with any relevant land-use suitability assessments and agricultural policy
Net public benefit	• It has no adverse impact on reliability and capacity to deliver existing entitlements. The health of the environment must be maintained or improved • Net public benefits to the Victorian economy and community values must be demonstrated
Value for money	• It has undergone a positive cost–benefit analysis of social, cultural, economic and environmental outcomes, including water savings and market value of water, economic growth and environmental sustainability • Cost share with proponents for construction is proportionate to the public and the private benefits (‘user pays’ principle)

Proposed basis of principles for future water infrastructure investments

- The Victorian Government will consider contributing funding for water infrastructure where there are net public benefits, such as:
- enabling water to be returned to the environment and Traditional Owners
- providing economic benefits to the region
- providing water affordability for urban water customers
- improving environmental and climate adaptation
- providing cultural, social, wellbeing or recreational benefits.

Water corporation and Victorian Government funding of water infrastructure projects will use a quadruple-bottom-line analysis, will be transparent, and will demonstrate that the chosen investment is the most effective way to achieve customer and public benefits with the available funding.

Victorian Government funding agreements must be consistent with relevant legislation, policies and strategies.

Where applicable, business cases must be consistent with Department of Treasury and Finance guidelines.

9.3 Challenges and considerations in how we invest in water infrastructure

Even with Victoria's regular orders for desalinated water, average household water bills in Victoria are among the lowest in the country. Households in Melbourne pay, on average, about $100 per year less than in Sydney and $600 per year less than in Perth (BOM, 2021). Although water is widely regarded as a valuable and increasingly scarce resource, water pricing does not reflect the full cost of using water, or its importance to the community, including environmental, Traditional Owner and social values.

These broader costs are recognised to some extent in water pricing, as the water sector works to minimise these impacts, for example by funding projects to offset the environmental harms caused by water extraction. In economic terms, however, it can be difficult to fully account for these , when comparing the cost of options that take water from a river to the cost of new manufactured water sources. With demand for water growing, and river water becoming more scarce, we must consider how we most equitably account for the broader costs of using all water sources when making decisions about future water supply investments.

Assessing broader benefits

Investing in infrastructure to grow our water supplies can bring many benefits across the region, beyond the supply of water to our growing cities and towns. New infrastructure can provide more opportunities to return water to Traditional Owners, improve waterway health, and offer social and recreational benefits (see **Chapter 8**). Investments can create jobs and economic opportunities for industry and businesses, generating broader economic benefits for the region. For these reasons we propose using a quadruple-bottom-line analysis to assess all major water infrastructure projects and identify the full costs and benefits from the social, cultural, environmental and economic perspectives. This will inform decision-makers about the viability of projects, but also help identify benefits beyond urban water supply.

Traditional Owners, who have cultural rights and responsibilities but were previously excluded from water markets, should not now be expected to bear the cost of purchasing new and more expensive water sources. An additional challenge will be to clearly allocate costs to beneficiaries when substitution arrangements are used (as described in **Section 8.1**). Funding arrangements should be as equitable and just as possible and will need to be developed on a case-by-case basis.

Stormwater and recycled water infrastructure

In most cases, recycled water and stormwater cost more than river water and desalinated water, due to the cost of treating, storing and distributing them to where they are needed. Unlike water sourced from desalination, stormwater and recycled water require duplicated infrastructure (including purple pipes) to transport them from where they generated to where they can be used. More detail on the challenges and opportunities of using all sources of water can be found in **Chapter 7**.

The cost of treating, storing and distributing recycled water and stormwater remains a barrier to their widespread use. The viability of recycled water schemes to date has been determined by whether the water corporation's customers are willing to pay for the cost of the scheme, and whether those costs can be attributed to water savings or to delaying major infrastructure investments. Because customers who use recycled water or stormwater are often not the only beneficiaries, the cost can make such schemes a financially unviable investment for a water corporation. This is despite the benefits extending beyond the customer to the broader water sector, community and the environment.

Not all public benefits are easily quantified or converted into a monetary value for the purpose of preparing a business case or completing a cost–benefit analysis. It is important to consider the full range of costs and benefits, especially as we better incorporate social, environmental and cultural values into our assessments via the quadruple-bottom-line analysis. For example, benefits that are not always readily quantifiable include:

- greater resilience of the overall water system, due to the diversification of supply sources
- contribution to the circular economy from re-using different parts of wastewater — the water itself, and also by-products such as biowaste for fuel
- environmental protection and improvement through reduced discharge of stormwater pollution into local waterways
- greening and improved liveability from projects that do more than one thing (for example liveable green open spaces that capture water and provide urban cooling (Bowler et *al., 2010*)).

In many instances, stormwater and recycled water schemes or projects require Victorian Government co-investment to be viable, due to the broader public benefits. This is already happening through Victorian Government co-investment in projects identified through integrated water management forums.

Narre Warren activity centre stormwater network

In partnership with the Victorian Government, the City of Casey is building a stormwater network for the Fountain Gate–Narre Warren activity centre in Melbourne's south-east. The Victorian Government's $1.7 million contribution will support the first stage of the network, including an advanced stormwater harvesting and treatment system at the Max Pawsey Reserve. A distribution network will supply up to 50 megalitres per annum of treated stormwater for re-use through the area, including for irrigation of local parks.

Stead Park Sports Precinct in Geelong

Barwon Water, in partnership with the City of Greater Geelong and the Victorian Government, is funding an upgrade of Barwon Water's Northern Water Treatment Plant and associated infrastructure at Stead Park Sports Precinct in northern Geelong. This will deliver Class A recycled water to irrigate the sporting fields year round. The supply of recycled water will increase the usable playing surfaces and save 25 megalitres per year of drinking water.

The Victorian Government will continue to support integrated water management and better use of all water sources. This will require more investment in infrastructure to treat, store and deliver water to users. Future investments should consider whether the higher treatment and delivery costs of manufactured water have broader public benefits that may not be easily quantified in an economic assessment and that warrant government co-investment. This is particularly relevant for investments in recycled water and stormwater schemes, where net public benefits may be achieved but cannot be fully funded by the water industry.

Image: Fyansford papermill overlooking Buckley Falls, Fyansford Geelong, Wadawurrung Country

Creating a circular economy

Recycling Victoria is the Victorian Government's 10-year policy and action plan for waste and recycling. It sets out our plan of sweeping reform to establish a recycling system that Victorians can rely on, while transforming how the Victorian economy uses materials and how Victoria re-uses, repairs and recycles.

The water sector is well placed to support the transition to a circular economy, because of its access to suitable land, expertise in managing organic waste and treatment technologies, and commitments to resource recovery and reducing greenhouse gas emissions. Victoria's water and energy sectors already contribute to a circular economy by ensuring those resources are used efficiently for economic and environmental benefit. Complementary policies and strategies that Recycling Victoria cites are Water for Victoria, the Melbourne Sewerage Strategy and the Intelligent Water Network Program.

Melbourne Sewerage Strategy

Currently, water users pay for the cost of treating and disposing of wastewater (to agreed environmental standards for discharge). Users of recycled water, such as irrigators and industrial customers, pay to improve its quality so that the water is fit for its intended purpose, such as irrigation or household use. This is sometimes referred to as 'polluter pays', because water users pay the proportion of costs that covers the collection, treatment and disposal of the waste, rather than the full cost of treating the waste to a re-use standard. **Figure 9.1** shows the opportunities offered by a transition from the current linear treatment system for wastewater towards a circular-economy or resource-recovery system.

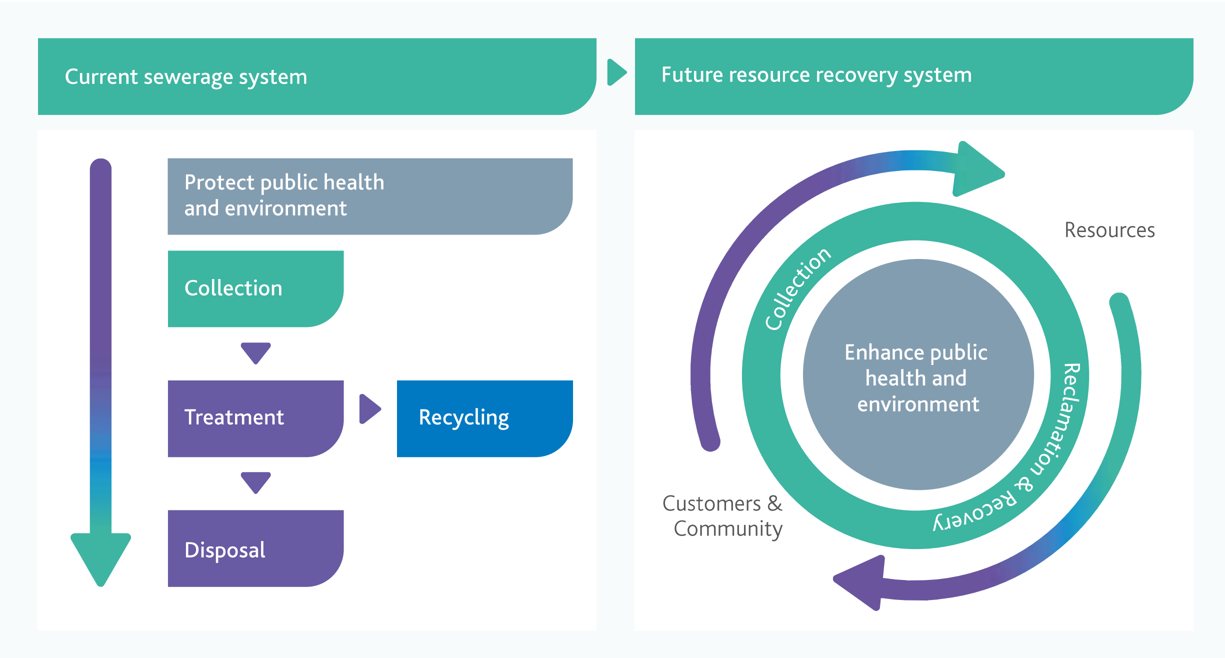


Figure 9.1: Transitioning from a linear treatment system to a circular-economy system (source: Melbourne Water, 2017)

Public investment: rural water infrastructure

Investments in rural water infrastructure can bring significant public and private benefits. Upgrades to old irrigation systems can improve water efficiency, and new rural water supplies can increase productivity, allow for expansion, and improve the wellbeing of rural communities. The environment also benefits from new water infrastructure that reduces stormwater and recycled water discharges into waterways.

Water corporations can maintain and upgrade rural water infrastructure under current cost-recovery arrangements. The Victorian Government can also invest in rural water infrastructure in partnership with communities, if a business case demonstrates that the project will provide net benefit to the public, and if funding is available.

Investments in rural water infrastructure will continue to be made according to the Victorian Government's principles for public investment in rural water infrastructure, thus ensuring long-term viability, net public benefit and value for money.[19] For example, the government will consider investing in feasibility studies such as the Southern Victorian Irrigation Development Project, where there is significant community and industry support and the project is consistent with the investment principles.

Southern Victorian Irrigation Development Project

Southern Rural Water, with investment from the Victorian Government, has been working with local farming communities and stakeholders to investigate the potential for sustainable irrigation development in Central Gippsland. This work aims to build on the strengths of Central Gippsland that could underpin future growth in agriculture, including:

- access to Melbourne, national and international markets via road, rail and air
- fertile soils, moderate climate, good rainfall and access to supplementary water resources
- being less severely affected by climate change than other agricultural regions of Australia
- having strong supply chains already in place
- a strong, skilled workforce.

The most recent phase of the investigation has examined environmental values, cultural values, demand for agriculture, private willingness to pay and community involvement. Thus any future development of sustainable irrigation will comply with the Victorian Government's investment principles for rural water infrastructure.

Two areas — the Latrobe and the Avon catchments — have been shown to be economically feasible zones for future development of agriculture, with more work now required to further develop the initial concept design and consider access to available water (see **Chapter 10**).

19 Victoria's principles for public investment in rural water infrastructure were established in *Water for Victoria* in 2016 (DELWP, 2016).

Public investment: resilience and liveability

There is growing recognition around the world of the need for more flexible, adaptive water systems that are resilient to future uncertainty and the effects of climate change. We see uncertainty in the Central and Gippsland Region, where, despite increasingly dry conditions on average, communities are able to endure extreme droughts, floods, bushfires and storms, all of which have significant effects on water supplies. The water sector is managing this uncertainty by increasingly investing in more diverse water supplies and backup options in their distribution and treatment networks, and by installing fire- and flood-resistant infrastructure.

With increased urbanisation, demand for open space in urban areas is growing. Water will be essential for cool, green open spaces and healthy urban waterways. The water sector in Victoria is making advances in this area through pilot projects identified in the integrated water management forums (see **Chapter 7**). There are, however, only limited opportunities to do this more widely.

Under current institutional arrangements, water corporations are limited in their capacity to charge their customers in order to deliver projects to provide liveability, amenity or health and wellbeing benefits for the community. To deliver these types of outcomes, water corporations need to partner with other organisations, such as local councils who may have clearer accountability to delivery projects with these outcomes in mind — the principle behind the state's integrated water management forum.

Image: Werribee River, K Road, border of Bunurong Country and Wadawurrung Country

9.4 Infrastructure investment and affordability

Water prices are approved through a public process led by Victoria's independent price regulator, the Essential Services Commission (ESC., 2021). Future water prices will need to balance the cost of providing essential water and sewerage services with the need to keep water bills affordable. Water corporations are obliged to support people who are experiencing hardship, and any increase in water prices required in future is likely to require an increase in hardship grants and other support programs by urban water corporations.

How we pay for essential investments in the future to grow our water supplies, manage the effects of climate change and avoid water supply shortfalls will need to be a conversation we continue to have with all stakeholders and the community. Some key factors affecting water costs include the number of customers, operating and maintenance costs, ageing infrastructure and the cost of servicing debt.

Water corporations consider the acceptable level of costs for new water supplies through their Urban Water Strategies and Price Submissions, which vary across the region and take into consideration customer preferences and willingness to pay.

Feedback from water users tells us that there is strong community support for price stability. Where additional expense is justified, customers prefer gradual price rises over several years, rather than a large increase in a single year. The proposed Water Supply Readiness Roadmap (see Chapter 6) will give water corporations greater certainty about the investments in water supplies that will be needed over the longer term, the responsibilities for their planning and development and which of these they will be required to fund (in full or in part). This will help water corporations to plan early for potential new water supplies and identify ways to help smooth out any associated water price rises. While this will help by avoiding sudden, unplanned infrastructure costs that could impact water bills, any type of increase in water bills will require an increase in support for vulnerable customers. The next pricing period for most urban water corporations across the region will commence on 1 July 2023. The final version of this Strategy, including any new obligations for water corporations, will need to be considered in future pricing submissions.

How we share the cost of new water supplies will also help shape future investment decisions. We know that larger population centres will have a greater capacity to fund required infrastructure and further work will be undertaken to consider how costs can be equitably shared across the region and among all users who will benefit — whether directly or indirectly — from future investments.

No decisions have yet been made on which future water supply options will be built, or how they will be funded. The Victorian Government will consider community feedback on this discussion draft Strategy when finalising the Strategy, including the Roadmap. The Roadmap will then guide the required investigations and the pricing submission process for water corporations, who will consult their customers about potential new water supplies and their consequences for water bills. Further feasibility work is required for each likely near-term supply option, including expanding drinking water supplies and new recycled water and stormwater schemes. A quadruple-bottom-line analysis for each would consider the environmental, cultural, social and economic benefits and risks, as well as consequences for customers and affordability.

Image: Eskerine Falls Lorne, Eastern Maar Country

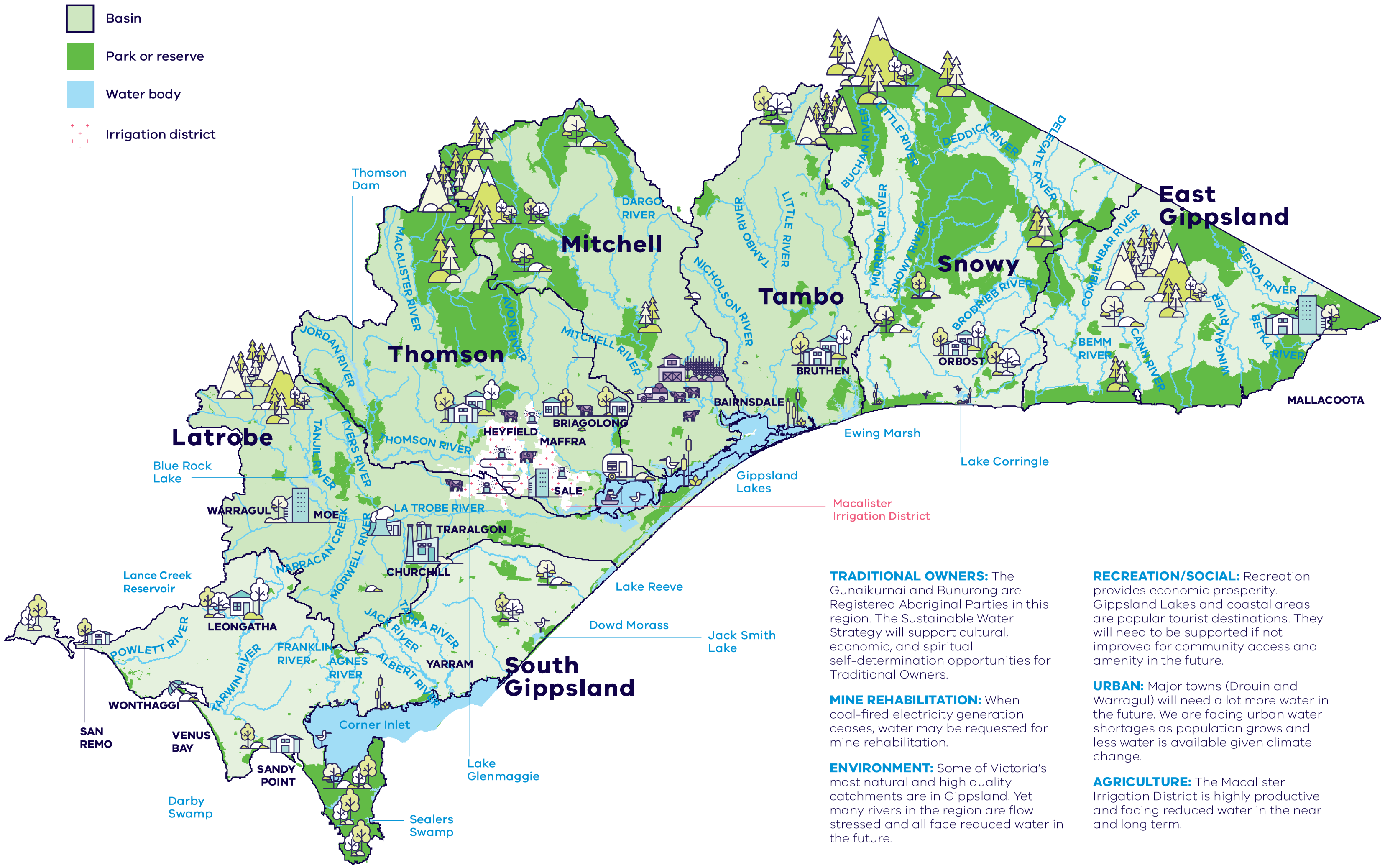
10. Gippsland sub-region

Image: Sale Common wetlands, Gunaikurnai Country

10.1 The sub-region

The Gippsland Region's water resources support the cultural values of Traditional Owners, the health of ecosystems, and many consumptive uses, including drinking water for regional centres and towns, a diverse and highly productive agricultural and irrigation industry, electricity generation, oil and gas production, fisheries, extensive recreation and tourism, and forestry plantations. The nation's largest pulp and paper mill and most of Victoria's electricity generation are in the Latrobe Valley, while some of the state's healthiest rivers are located in East Gippsland. The headwaters of several waterways in the region are characterised by native vegetation, with the mid to lower reaches flowing through predominantly beef and dairy agricultural lands. East Gippsland and parts of South Gippsland are characterised by unregulated waterways without major dams.

The rivers of the Gippsland Region are significant to Traditional Owners, including the Gunaikurnai and Bunurong peoples. Traditional Owners have a cultural responsibility to ensure that their lands and waters are looked after. For the Gunaikurnai, their land, waters and air are spiritual, life-giving resources that form the basis of their cultural practices. For Bunurong as custodians of Country, water is essential to Country and to caring for Country.



TRADITIONAL OWNERS: The Gunaikurnai and Bunurong are Registered Aboriginal Parties in this region. The Sustainable Water Strategy will support cultural, economic, and spiritual self-determination opportunities for Traditional Owners.

MINE REHABILITATION: When coal-fired electricity generation ceases, water may be requested for mine rehabilitation.

ENVIRONMENT: Some of Victoria's most natural and high quality catchments are in Gippsland. Yet many rivers in the region are flow stressed and all face reduced water in the future.

RECREATION/SOCIAL: Recreation provides economic prosperity. Gippsland Lakes and coastal areas are popular tourist destinations. They will need to be supported if not improved for community access and amenity in the future.

URBAN: Major towns (Drouin and Warragul) will need a lot more water in the future. We are facing urban water shortages as population grows and less water is available given climate change.

AGRICULTURE: The Macalister Irrigation District is highly productive and facing reduced water in the near and long term.

Figure 10.1: The Gippsland sub-region: basins, major water uses and some of the challenges faced

10.2 The challenge

The Gippsland sub-region is facing significant challenges: a drying climate, flow-stressed rivers, historical exclusion of Traditional Owners from water rights, existing urban water shortfalls and a transition away from coal-fired electricity generation. Any solution for this region needs to secure water for households, businesses, farmers, industry and Traditional Owners, and to return water to our local rivers.

The transition away from coal-fired electricity generation in the Latrobe Valley is already under way. These changes will continue to present both opportunities and challenges, including the potential for a transformation of water sharing across the region away from power generation to a range of other uses. The use of water in coal-fired electricity generation will decline as power stations cease operations. While some of this water may be requested by mine licensees for mine rehabilitation purposes, there are other opportunities that may seek access to this water to support the region's socioeconomic transition and build its climate resilience, by improving existing users' reliability of supply and providing access to water for industries to establish or expand in the region.

More water is also required to secure water supply for the rapidly growing towns of Warragul and Drouin. Coastal towns are experiencing high summer demands due to tourism, placing additional pressure on local water supplies and wastewater management.

For Gunaikurnai and Bunurong Traditional Owners, the rivers of this region are connected to Dreaming stories and have intangible cultural values, as well as including threatened sites of physical cultural heritage that must be protected for current and future generations. Water justice is sought through the return of water to Traditional Owners and water to support Traditional Owners' cultural values.

Water for the environment in many rivers in Gippsland is currently not sufficient to protect critical habitat and species. Existing dams and water use, in addition to the drying climate, mean that maintaining and improving the environmental values of waterways, including those feeding the Gippsland Lakes, require significant environmental water recovery. Water returned to the environment will help maintain water quality and support healthy rivers, lakes, wetlands and Country, which are central to the region's recreation, tourism and agricultural economies.

Image: Lake Wellington of the Gippsland Lakes, Sale, Gunaikurnai Country

Both dryland and irrigated farms across the region are affected by the drying climate, particularly during drought periods, such as the recent drought in East Gippsland. There is potential to improve the security of water supplies for irrigation, both within and outside irrigation districts, to create a climate-resilient agricultural sector for the long term.

Unregulated systems also need to be protected from the effects of a drying climate and increased water interception and extraction. The enduring protection of unregulated systems across the region (largely in the south and east) is vital, so that those waterways in good condition now remain that way despite climate change. This will be done by maintaining those existing caps and sharing rules that are proving suitable, and amending sharing rules in systems where baseflows are not enough to maintain the values of the waterway.

10.3 Water resources and uses

The waterways of four major catchments flow into the Gippsland Lakes: the Thomson, Latrobe, Mitchell and Tambo rivers (**Figure 10.1**). The South Gippsland Basin comprises several discrete river systems: the Powlett, Tarwin, Franklin, Agnes, Albert and Tarra rivers. All of these rivers flow from the Strzelecki and Hedley Ranges to Bass Strait via estuaries and coastal lagoons, with several of the major rivers flowing into the Corner Inlet Ramsar site. The East Gippsland Basin has numerous river catchments that rise in the south-eastern parts of the Great Dividing Range and flow into Bass Strait via estuaries and inlets. The Snowy River Basin spans two states: Victoria and New South Wales.

Across the Gippsland Basin, groundwater is used for irrigation, domestic and stock use, urban supply, salinity management, and the safe and stable operations of the Latrobe Valley coal mines. Groundwater (primarily as a drought supplement supply) is provided for urban use in Sale, Boisdale,

Image: Swing Bridge Sale, Gunaikurnai Country

Briagolong, Lindenow, Yarragon, Yarram and Mallacoota. There is a 500-megalitre aquifer storage and recovery facility north-west of Bairnsdale, using water from the Mitchell River when available.

Long-term groundwater declines are being observed in the deep, confined sedimentary aquifers of the Gippsland Basin. These declines are associated with depressurisation of the Latrobe Valley coal mines and offshore oil and gas extraction in Bass Strait.

Groundwater extraction will be needed to maintain the stability of the Hazelwood and Loy Yang mine voids for decades and, in the case of Loy Yang, to continue coal mining for electricity generation (Loy Yang power station is not due to close until 2048). Groundwater levels remain stable in the area directly beneath the coal mines, but regional water levels are declining due to depressurisation.

Groundwater declines in the sedimentary aquifers as a result of offshore oil and gas extraction in Bass Strait occur regionally, in the general area of Lakes Entrance, Bairnsdale, Sale and Yarram, with the greatest declines observed along the coastal areas of the Gippsland Basin.

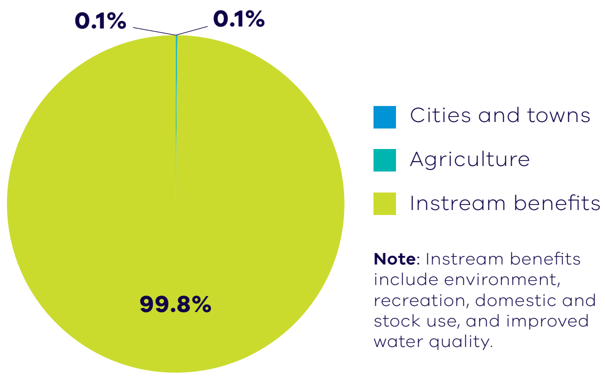
Relatively small volumes of recycled water are generated across the region, used mainly for agricultural irrigation, and also on sporting fields and significant gardens.

Water use in Gippsland is predominantly for irrigated agriculture, including the Macalister Irrigation District. Water for cities and towns includes use both within Gippsland and in Greater Melbourne from the Thomson Reservoir, which is the largest storage supplying water to Melbourne but has not reached full capacity since 1996. Water from the Latrobe River is used for electricity generation. Traditional Owners only recently accessed water as a result of 2 gigalitres from the Mitchell River being returned to the Gunaikurnai. While on an annual average basis only a small proportion of a river's total water might be extracted in a given year (**Table 10.1**), the proportion extracted during the dry months of the year can significantly affect the river.

For additional information on water uses for all basins in the Gippsland sub-region, please refer to the **Further information** section at the end of this document.

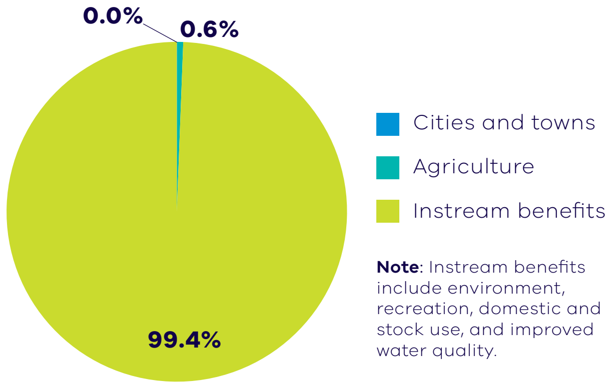
Table 10.1: **River water availability in the Gippsland sub-region, by water user[20]**

East Gippsland Basin: Water allocated for consumptive use averages is less than 0.5 per cent of the total resource available. Entitlements consist primarily of take-and-use licences to divert water for agriculture, and three bulk entitlements held by East Gippsland Water for urban water supply.



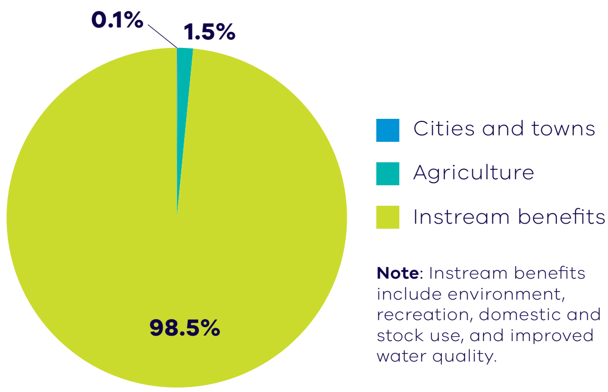
Note: Instream benefits include environment, recreation, domestic and stock use, and improved water quality.

Snowy Basin: A significant proportion of the Snowy River's flow is extracted from the upper parts of the Snowy catchment for the Snowy Mountains Hydro-electric Scheme in New South Wales.[21] This makes the Victorian Snowy flow-stressed, despite less than 1 per cent of the total water available in the Victorian Snowy Basin being allocated to consumptive use. There are licensed diversions for irrigation, and bulk entitlements are held by East Gippsland Water to supply the towns of Orbost and Buchan.



Note: Instream benefits include environment, recreation, domestic and stock use, and improved water quality.

Tambo Basin: Less than 2 per cent of average annual inflow is allocated to consumptive use. There are licensed diversions for irrigation, and bulk entitlements are held by East Gippsland Water to supply the township of Swifts Creek.

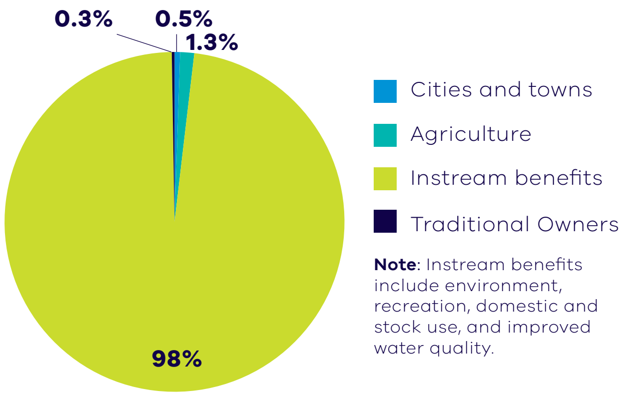


Note: Instream benefits include environment, recreation, domestic and stock use, and improved water quality.

20 Excludes water use under section 8 rights.

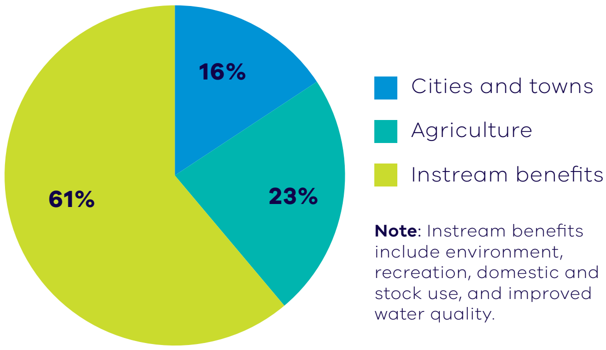
21 The obligations on Snowy Hydro Limited to release water to the Snowy River increased in 2002 following changes to the licence and investment by the Victorian, New South Wales and Commonwealth governments to recover water for the health of the river under the Snowy Water Initiative. Targets for the Snowy Water Initiative included returning 21 per cent of average natural flows to the Snowy River through water savings projects in Victorian and New South Wales irrigation systems that receive water from the Snowy scheme. Water recovery projects were completed in June 2012.

Mitchell Basin: Less than 3 per cent of average annual inflow is allocated to consumptive use. Although diversions are relatively small, there is competition for water during summer when there is little flow in the river. Licensed diverters are the basin's largest user of consumptive water, supporting the local economy through irrigated agriculture on the floodplain. East Gippsland Water holds a bulk entitlement to provide urban water to Bairnsdale and Paynesville, as well as townships in the neighbouring Tambo Basin. Traditional Owners only recently accessed water as a result of 2 gigalitres on the Mitchell River being made available.



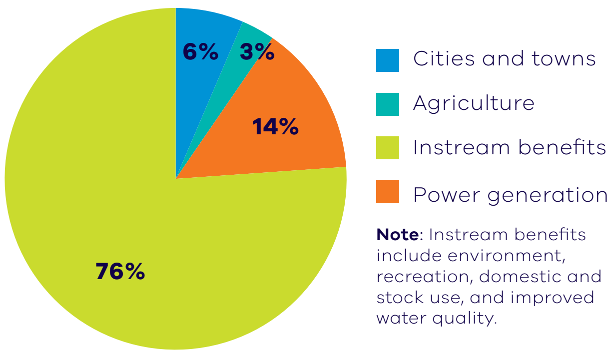
Note: Instream benefits include environment, recreation, domestic and stock use, and improved water quality.

Thomson Basin: Consumptive water use comprises urban supply to Melbourne (and other interconnected urban systems) and local towns, supply to the Macalister Irrigation District, and licensed diversions for irrigation.



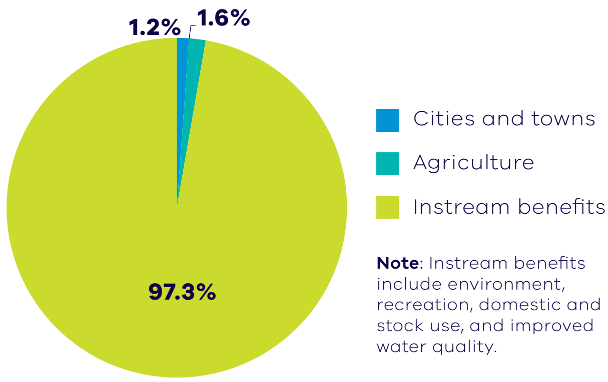
Note: Instream benefits include environment, recreation, domestic and stock use, and improved water quality.

Latrobe Basin: Uses include urban water supply, irrigated agriculture, power generation and other industry. A highly reliable water supply is critically important for power generation, other industry and urban users. The Latrobe Reserve bulk entitlement ensures that essential service industries, urban users and other entitlement holders can obtain additional water during drought to avoid shortfalls. Additionally, the Latrobe Loy Yang 3/4 Bench bulk entitlement is currently set aside for future electricity generation (see **Section 10.4**).



Note: Instream benefits include environment, recreation, domestic and stock use, and improved water quality.

South Gippsland Basin: Only approximately 3 per cent of the total water available is allocated to consumptive use. Uses include supply to towns and licensed diverters. A total of 13 bulk entitlements are held in the South Gippsland Basin for urban supply by Gippsland Water, South Gippsland Water and Westernport Water.



Note: Instream benefits include environment, recreation, domestic and stock use, and improved water quality.

Seasonal variability

Water availability and the way water is shared are typically expressed as average annual volumes. However, both the natural flow in rivers and demands for water vary substantially between seasons each year. For example, the Mitchell River's flow in winter months has been five times higher than in summer months over the past five years, despite that period including some years with low inflows (**Figure 10.2** and **Figure 10.3**).

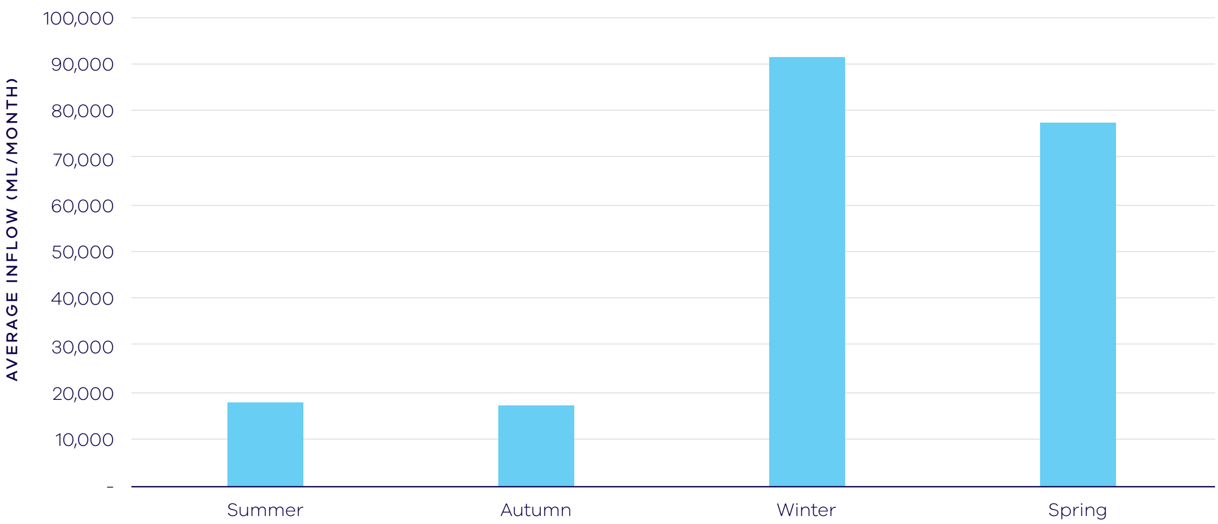


Figure 10.2: Seasonal variation in flow in the Mitchell River (at Glenaladale), 2016–20

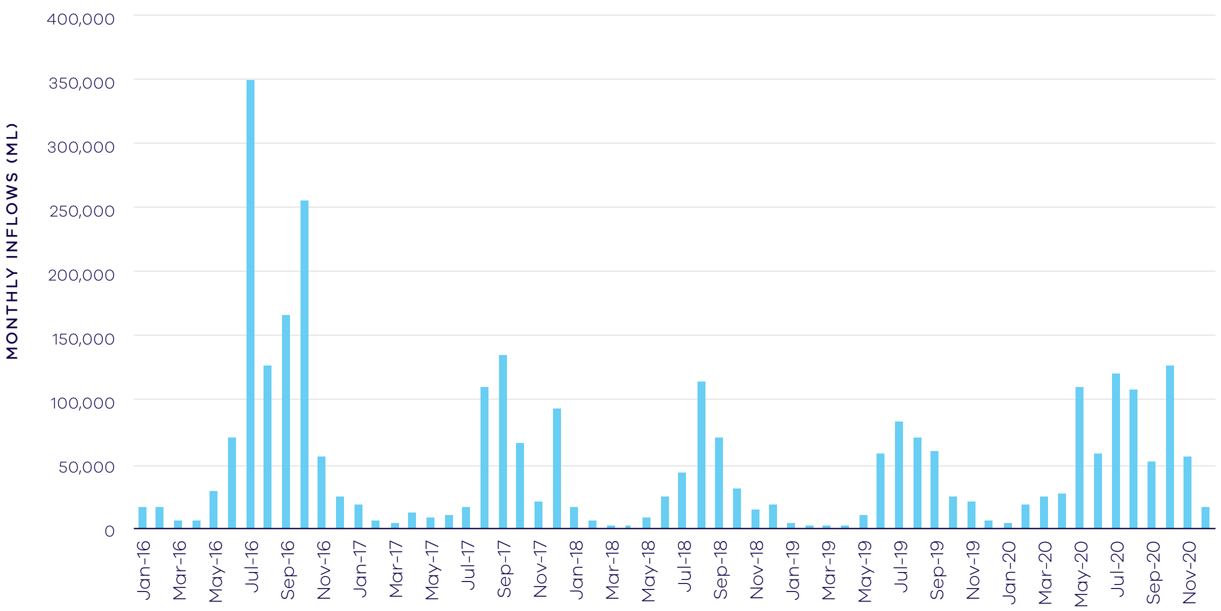


Figure 10.3: Average monthly inflows by season in the Mitchell River (at Glenaladale), 2016–20

Because peak demands for water typically coincide with periods of summer–autumn low flow, even unregulated rivers with low volumes allocated to consumptive use may come under flow stress.

To protect low flows, diversions for consumptive use — such as irrigation — must reduce or cease when flow in rivers falls below trigger levels. Winterfill licences restrict take to wetter months of the year. For example, East Gippsland Water's Bairnsdale bulk entitlement has rules to limit take from the Mitchell River that vary both seasonally and with the flow conditions. To ensure the security of high-quality, reliable drinking water, East Gippsland Water has approval to store up to 500 megalitres of water sourced from the Mitchell River in Woodglen groundwater aquifers, using a process known as aquifer storage and recovery. This is in addition to its two off-stream storages, which have a combined capacity of 1,450 megalitres.

During periods of high flow (generally in winter and spring), water is transferred from the Mitchell River to the aquifers and off-stream storages. During lower-flow periods, this stored water is extracted and treated for supply to customers in the Mitchell River Water Supply System, which includes the towns of Lindenow, Bairnsdale, Paynesville, Bruthen, Metung, Lakes Entrance and Nowa Nowa.

Changes in water availability

Over the long term, water availability in the Gippsland sub-region is declining. Total available water has decreased by 5 to 14 per cent across all river basins, when the historical inflow record used for the last Sustainable Water Strategy is compared to the 1975 baselines (**Figure 10.4**). Since 1997, inflows have declined by between 23 and 38 per cent compared with historical inflows (DELWP, 2020b).

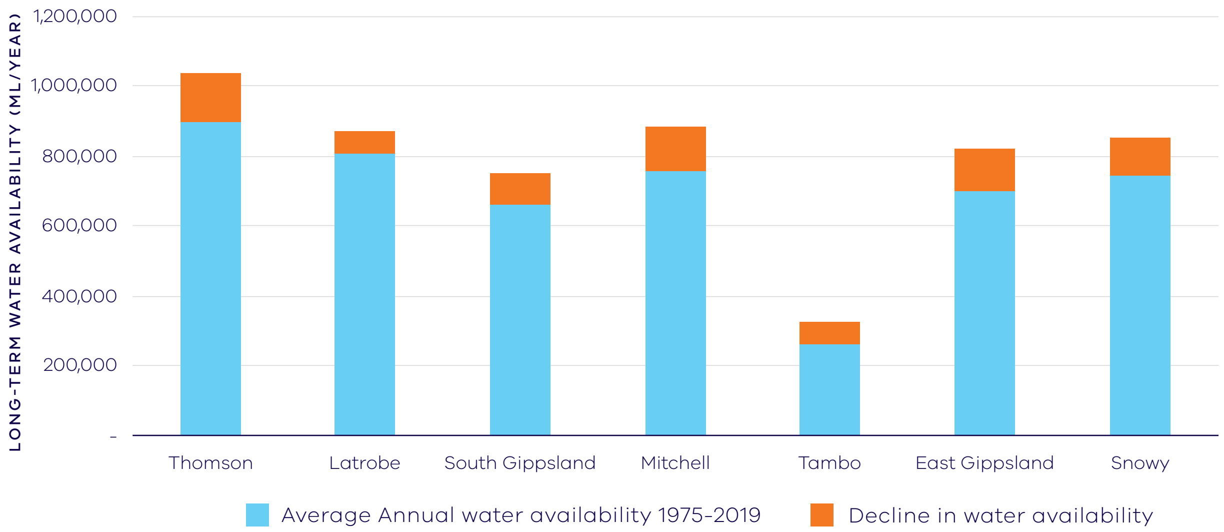


Figure 10.4: Long-term average annual water availability and decline across Gippsland

Future water projections

Low, medium and high climate change scenarios to the year 2065 were used to represent potential future water availability across Gippsland.[22] For most basins there is an increase in the average future water availability for the low climate change projection when compared with the post-1975 historic climate reference period, and significant declines under medium and high climate change projections (**Table 10.2**).

For additional information on climate change projections for all basins in Gippsland, please refer to the **Further information** section at the end of this document.

22 Future water availability projections were made using RCP8.5 (see **Appendix D**), in accordance with the *Guidelines for Assessing the Impact of Climate Change on Water Availability in Victoria* (DELWP, 2020a).

Table 10.2: Climate change scenarios (RCP8.523) to the year 2065

Basin	Post-1975 reference point (GL/year)	Post-1997 reference point (GL/year)	Low climate change projection (GL/year)	Medium climate change projection (GL/year)	High climate change projection (GL/year)
East Gippsland	700	508	850	643	425
Snowy	746	652	903	613	477
Tambo	263	209	317	228	158
Mitchell	756	660	767	638	418
Thomson	897	764	915	773	521
Latrobe	811	629	811	678	474
South Gippsland	659	557	669	547	364

Disruptive events: effects on future water availability

Victorians have seen at first hand the devastation that extreme weather events can have on waterways, water supply catchments and water infrastructure. Droughts, floods, storms, bushfires, heatwaves, algal blooms and pollution can disrupt the use and enjoyment of water resources and cause long-lasting economic, health and environmental harm to communities. With climate change projected to increase the intensity and frequency of extreme weather events, we need to be building, maintaining and strengthening the resilience of our systems.

In East Gippsland, more than half (53 per cent) of the water supply catchment area was affected by the 2019–20 bushfires, affecting water availability and quality of waterways, and damaging critical water infrastructure. The Victorian Government's bushfire recovery program is supporting the long-term recovery of East Gippsland's waterways and catchments and helping to build resilience in critical water infrastructure. Actions include:

- repairing riparian fencing and off-stream watering systems, and works to tackle priority threats such as weed control (East Gippsland Catchment Management Authority)
- replacing and improving water monitoring stations, emergency water supply points and flood warning gauges across East Gippsland (Department of Environment, Land, Water and Planning)
- repairing and upgrading water treatment plants, installing backup solar power, and upgrading supervisory control and data acquisition equipment (East Gippsland Water).

Several research projects — led by the Victorian Government, Melbourne Water and University of Melbourne — are already improving our understanding of the effects of bushfires on land, water quality, water yield and vegetation. This work includes modelling the effects of landslides and erosion in catchments affected by bushfires, and the effect of bushfires on catchment water yield in a drying climate.

10.4 Latrobe Valley water transition

For generations, brown coal mines in the Latrobe Valley have powered Victoria's economy by fuelling most of the state's electricity generation. This has, in turn, been supported by the Latrobe River system, which has been significantly modified over time to supply high-reliability water and enable coal mining, all to ensure Victoria's energy security. The closure of the Hazelwood Power Station in 2017, and the scheduled closures of power stations at Yallourn in 2028 and Loy Yang in 2048, signal a fundamental shift in the region as more renewable energy sources come online and demand for electricity from brown coal reduces.

Because newer sources of energy will not require the same volumes of water as coal-fired electricity generation, the Latrobe Valley electricity industry's transition offers the region the potential for a water transition too. This could go some way towards countering the decline in water available for consumptive uses and the environment. It could create jobs and stimulate economic activity, and help build the region's resilience to climate change and variability.

A water transition offers potential benefits for:

- **Traditional Owners** — who have long been excluded from water ownership and are seeking return of water rights
- **the environment** — including the Latrobe River, Latrobe wetlands and Gippsland Lakes, which are experiencing the effects of reduced water availability, in part due to climate change and variability, and which have been disproportionately affected by these declines compared to consumptive uses
- **urban water security —** securing supplies for local towns that can be supplied from the Latrobe system over the long term
- **tourism and recreation** — including local jobs, businesses and communities, and visitors, all of which rely on healthy waterways
- **irrigated agriculture** — including irrigation expansion, and improved water quality from additional environmental water
- **existing and emerging industries** — to invest in the region to create jobs and economic growth
- **mine rehabilitation** — depending on the mine rehabilitation plan proposed up to 2,800 gigalitres of water could be requested to completely fill all mine voids over time if a water-based approach to rehabilitation is the final approved rehabilitation solution for all mines (DJPR, 2020).

Table 10.3 summarises possible short- and long-term water demands on the Latrobe River system for a range of water uses.

Image: Yallourn Power Station above Lake Narracan, Newborough, Gunaikurnai Country

Table 10.3: Overview of possible future water demands on the Latrobe River system

Primary use and users	Flow-on benefits and values	Future potential water demands (GL per year)	
		Short to medium term (10 years)	Longer term (10–50 years)
Traditional Owners	Greater progress towards securing Traditional Owner water rights in Victoria Healthy Country Support of Traditional Owner self-determination	Gunaikurnai Land and Waters Aboriginal Corporation will seek an equitable proportion of any water that becomes available, rather than nominating a volume	
Agriculture	Economic and job growth Food security	Up to an additional 10–20 GL/yr (RMCG., 2021)	
Electricity generation	Energy security	Expected to be less than existing bulk entitlements for electricity generation	
Environment	Maintenance and potential improvement and restoration of a major river system, including its Ramsar-listed wetlands (Latrobe and Tyers rivers)	Up to an additional 22 GL/yr[23]	Up to an additional 137 GL/yr (excluding the Lower Latrobe Wetlands and Latrobe estuary)
Industrial/ manufacturing	Jobs and economic growth	Uncertain — Gippsland Water is consulting with industries that have potential for development and may need water supply from surplus availability within its current bulk entitlement	
Mine rehabilitation	Safe, stable and sustainable landforms New uses for rehabilitated voids and surrounding land	Dependent on rehabilitation plans and the extent to which they use a combination of non-water rehabilitation, manufactured water, river water and groundwater for rehabilitation. At least 15 GL/yr (across all three mines) would be needed in perpetuity to maintain the safety and stability of the mine voids, if water-based rehabilitation options are approved[24]	

23 This number does not include the full volumes required for the Latrobe estuary or Lower Latrobe Wetlands.

24 See **www.water.vic.gov.au/planning/LVRRS/support.**

Primary use and users	Flow-on benefits and values	Future potential water demands (GL per year)	
		Short to medium term (10 years)	Longer term (10–50 years)
Social and recreational uses, including tourism	Economic, aesthetic and wellbeing benefits that the community derives from the use of waterways for social and recreational purposes	Maintenance/improvement of flows (see environmental water recovery targets above, as environmental flows benefit recreation and tourism too)	
Urban water supply (residential, commercial and minor industrial)	Avoided water restrictions where demand can be met	Urban water demand is expected to grow in line with forecast population growth from around 7.8 GL/yr to 15.6 GL/yr in 2070[25]	

The Sustainable Water Strategy will not make decisions regarding the future use of bulk entitlements currently used for electricity generation at Yallourn, Loy Yang A and Loy Yang B. Decisions on the future of these entitlements will not be made more than five years before power station closures, as they might be required for future mine rehabilitation (DJPR, 2020).

To protect the security of existing entitlements for other water users, and prevent further environmental harm, the maximum annual amount of water from the Latrobe River system used for mine rehabilitation would need to be no more than the power stations' historical annual net usage (55 gigalitres per year across the three mines — **Figure 10.5**), and may even need to be smaller than this (DJPR, 2020). As part of the implementation of the Latrobe Valley Regional Rehabilitation Strategy, the Latrobe Valley electricity generators and mine licensees will be given guidance on how much water may be allocated and used for mine rehabilitation, including indicative conditions on any future potential water accessed for mine rehabilitation. This information will help these companies prepare their Declared Mine Rehabilitation Plans.

There are opportunities to counter the water availability declines experienced in the Latrobe River system, and to help meet water demands and quadruple-bottom-line objectives in the region:

- Some water is available within Gippsland Water's existing bulk entitlements for supply to support economic activity, including new energy enterprises.
- Surplus water in the Latrobe Loy Yang 3/4 Bench bulk entitlement (see **Section 10.4**) that exceeds likely volumes needed for future electricity generation can be made available for other needs.
- A review of the Latrobe Reserve bulk entitlement would help determine the potential for water to become available when it is no longer needed as a safeguard to protect the ultra-high reliability of supply for electricity generation and industry against water shortages.
- In parallel to the transition away from coal-fired electricity generation, there may be potential for a staged broad-scale redesign and/or environmental rehabilitation of the Latrobe River and associated water supply system.

Figure 10.6 sets out the timeline for major decisions in the Latrobe Valley to facilitate the region's industrial and socio-economic transition and counter the effects of climate change and climate variability on the uses and values of the system's water resources.

25 Gippsland Water's revised Urban Water Strategy is due to be released in 2022, with updated demand projections.

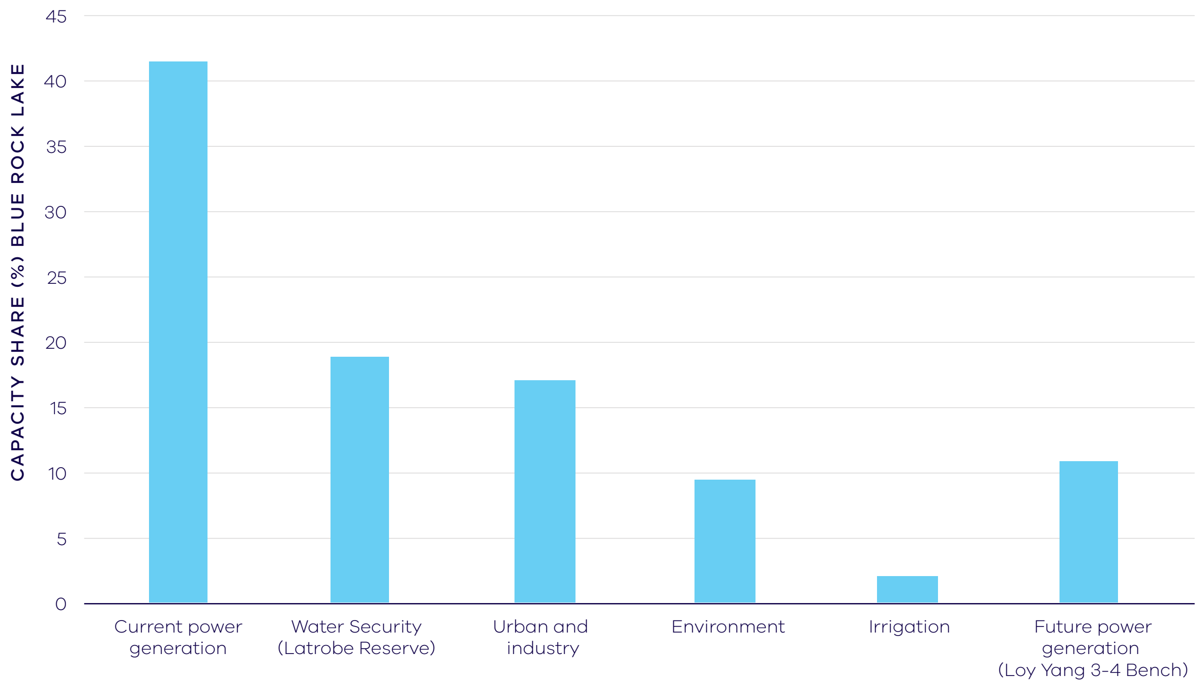


Figure 10.5: **Current shares of Blue Rock Reservoir reflect the storage's historical importance in providing water for electricity generation**

Image: Jetski on Lake Narracan, Newborough, Gunaikurnai Country

2022

Central and Gippsland Region SWS

Final Central and Gippsland Region SWS is released.

Surplus of Latrobe Loy Yang 3/4 Bench bulk entitlement made available to other users

2023

Yallourn: Potential application for water entitlements

Consistent with Latrobe Valley Regional Rehabilitation Strategy policy, Yallourn mine licensees can apply for water entitlements for purposes of mine rehabilitation (if required) five years before scheduled.

Latrobe Valley Regional Rehabilitation Strategy

Release of next iteration of Latrobe Valley Regional Rehabilitation Strategy before June 2023.

2027

Review of the Latrobe Reserve bulk entitlement

Evaluation of the ongoing need for the Latrobe Reserve, in the light of the expected changes in the profile of both water demand and availability in the Latrobe River system.

Latrobe Reserve bulk entitlement: Potential reallocation opportunity

Re-allocation opportunities may be concomitant with the review of the Latrobe Reserve if the review recommends a reduction in the size of the reserve.

2028

Yallourn Power Station closure

Confirmed scheduled closure of Yallourn Power Station.

Latrobe Yallourn bulk entitlement: Potential reallocation opportunity

Dependent on outcomes of any application for water mine rehabilitation made by Yallourn mine licensees.

2040s

2043, Loy Yang: Potential application for water entitlements

Consistent with Latrobe Valley Regional Rehabilitation Strategy policy, Loy Yang mine licensees can apply for water entitlements for purposes of mine rehabilitation (if required) five years before scheduled closure.

2048: Scheduled closure of Loy Yang A and Loy Yang B power stations

2048, Loy Yang A & B bulk entitlements: Potential reallocation opportunities

Dependent on outcomes of any application for water for mine rehabilitation made by Loy Yang mine licensees.

Potential broadscale redesign of the Latrobe River system

There will be a longer-term opportunity to conduct a broadscale redesign of the Latrobe river system once the transition away from coal-fired electricity generation in the Latrobe Valley is complete.

AND BEYOND!

- Latrobe Valley Regional Rehabilitation Strategy related event
- SWS related event
- Point at which there may be potential for reallocation of entitlements to occur

Figure 10.6: Timeline for major decisions in the Latrobe Valley's industrial and socio-economic transition

Latrobe Loy Yang 3/4 Bench bulk entitlement

Electricity generation currently takes the largest share of water from inflows to Blue Rock Reservoir (**Figure 10.5**).

The Victorian Government holds an unused water entitlement in the Latrobe River system known as the Latrobe Loy Yang 3/4 Bench bulk entitlement. It consists of a share of inflows and storage of Blue Rock Reservoir and Lake Narracan, to a maximum of 25 gigalitres per year. It was created at the time of electricity industry privatisation to be the water source for any future electricity generation development on a parcel of crown land adjacent to Loy Yang B power station, named the Loy Yang 3/4 Bench.

To provide energy security for Victoria, future electricity generation will remain the priority purpose for this water entitlement. Estimates of future water needs for energy production from the Loy Yang 3/4 Bench are yet to be confirmed, but are likely to be much less than the 25 gigalitres per year available under the existing entitlement, because new energy development is likely to be much less water-intensive than coal-fired electricity generation. Therefore, surplus water from the Latrobe Loy Yang 3/4 Bench bulk entitlement may soon become available for other uses. Any decision to reallocate the water will need to consider the future sustainability of the resource.

Surplus volumes from the Latrobe Loy Yang ¾ Bench bulk entitlement could go some way to building the region's resilience to climate change and variability, offering many cultural, social, economic and environmental benefits. Consistent with the Latrobe Valley Regional Rehabilitation Strategy, surface water for mine rehabilitation must be limited to the current net historic take for power generation, or a volume smaller than this.

With so many potential uses and benefits from this water, the Victorian Government is seeking the community's views about future priorities for the Latrobe Loy Yang 3/4 Bench bulk entitlement. The following principles could guide future decisions:

- Make sufficient water available for expected future electricity demands to provide energy security for Victoria.
- Return a portion of available water to Traditional Owners.
- Explore opportunities to contribute to any unmet environmental water recovery targets.
- Explore opportunities to make water available for uses that support the region through its socioeconomic transition and help build its resilience to climate change and variability.

Proposed direction 10-1:

- **The Victorian Government proposes that decisions about the water from the Latrobe Loy Yang 3/4 Bench bulk entitlement will consider sharing between Traditional Owners, the environment, agriculture and other uses, to support the region's socio-economic transition and build its resilience to climate change and variability, taking account of the volume of water required to support Victoria's energy security.**

Mine rehabilitation in the Latrobe Valley

The Victorian Government's Latrobe Valley Regional Rehabilitation Strategy is a regional-scale blueprint to guide the Latrobe Valley electricity generators/mine licensees,[26] government and the community in transforming the Latrobe Valley coal mines and adjacent lands to safe, stable and sustainable landforms.

The Victorian Government, in collaboration with the Latrobe Valley electricity generators/mine licensees, is continuing to investigate regional scale rehabilitation options, including water-based ones. Because rehabilitation will be undertaken as each mine closes, the volume of water, if required at all, will vary over time and for each location. If a water-based mine rehabilitation method were to be selected, rehabilitation could take many decades and may require a range of water sources – including surface water, groundwater and manufactured water sources to meet the requirements of the mine rehabilitation plan.

26 'Electricity generators' refers to the private entities that produce, or once produced, coal-fired electricity in the Latrobe Valley. 'Mine licensees' refers to those private entities that currently hold a mine licence for one of the three coal mines. The company that owns the land and holds the mining licence for Hazelwood mine generated electricity at the Hazelwood Power Station until 2017. The owners of Loy Yang B Power Station have a share in mine rehabilitation responsibilities at the Loy Yang mine but are not the mining licence holder. The term 'electricity generators/mine licensees' is used unless a statement is only applicable to one or the other.

Electricity generators/mine licensees have been clear that — from their perspective — water is the only practicable option for mine rehabilitation (DJPR, 2020). The Latrobe Valley Regional Rehabilitation Strategy does not commit to a water-based approach to rehabilitation. The strategy indicates that any decision on using water for mine rehabilitation will need to take into account availability of different water sources and a drying climate, and should not negatively impact on Traditional Owners' values[27], environmental values of the Latrobe River system and the rights of other existing water users. (**Figure 10.7**).

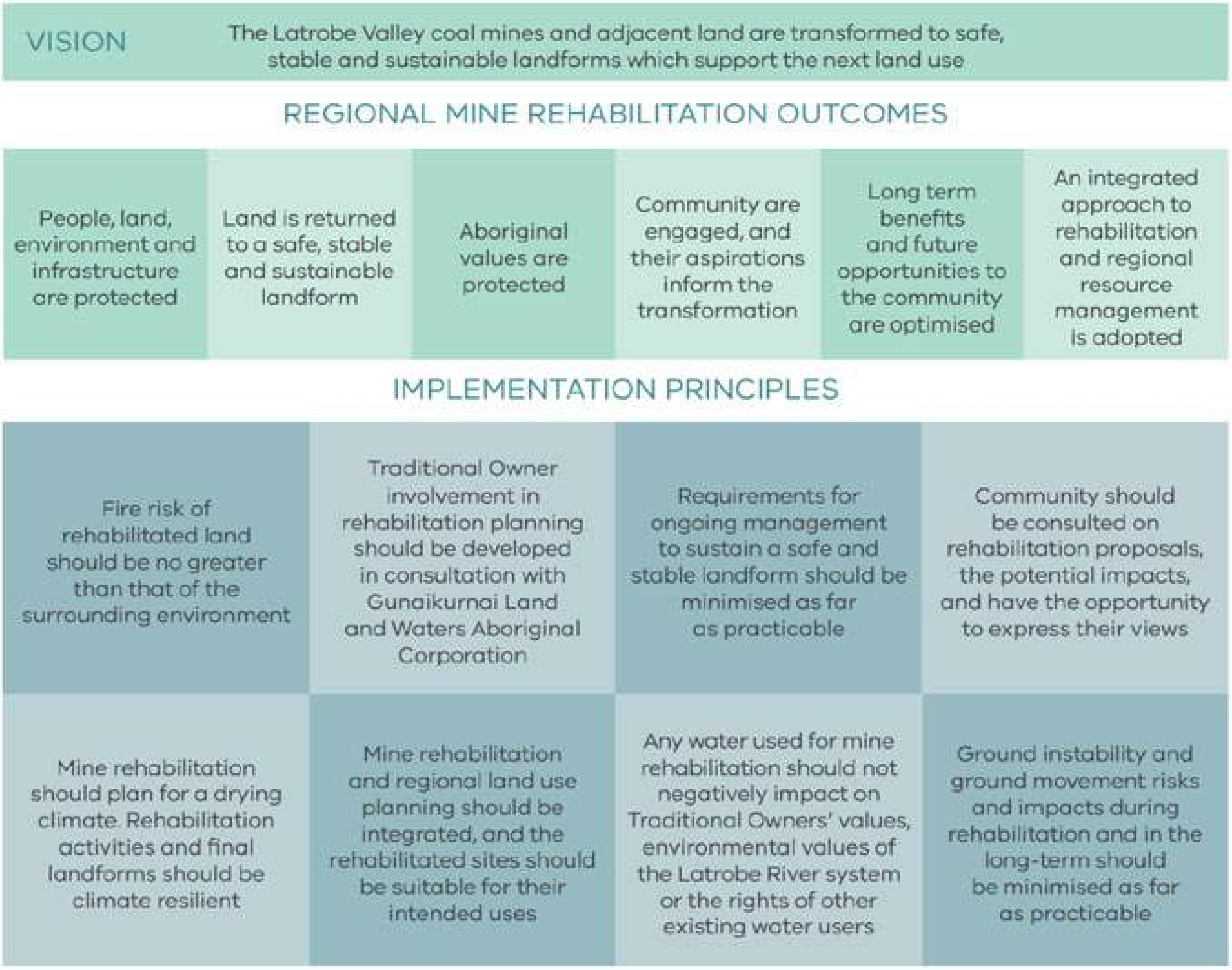


Figure 10.7: Vision, outcomes and principles of the Latrobe Valley Regional Rehabilitation Strategy (DJPR, 2020)

Options for mine rehabilitation that do not rely on water from the Latrobe River system are being considered. For example, the Victorian Government is exploring the feasibility of using manufactured water, such as recycled water, as well as non-water-based options.

If the electricity generators/mine licensees of the operational power stations at Yallourn, Loy Yang A and Loy Yang B wish to seek to use water from the Latrobe River system for mine rehabilitation, they can apply to the Minister for Water for entitlements that extend to this purpose five years before ceasing mining operations at the site (DJPR, 2020). **Table 10.4** shows the bulk entitlements in the Latrobe River system for electricity generation at these sites.

27 Traditional Owners' values identified by the Gunaikurnai Land and Waters Aboriginal Corporation include practice, future use, place-based, affective, custodial, wellbeing, relational, identity and social cohesion values.

Between 2006–07 and 2018–19, the Latrobe Valley electricity generators/mine licensees used, on average, around 78 gigalitres per year of surface water from the Latrobe River system for electricity generation, and around 28 gigalitres per year of groundwater was extracted to maintain the stability of coal mine voids during mining activities. Around 23 gigalitres per year has been returned to the Latrobe River system — this has been used by irrigators and provided benefits to the environment. As a result, the net surface water usage of the Latrobe Valley electricity generators/mine licensees has been around 55 gigalitres per year (**Figure 10.8**).

To protect the security of existing water users' entitlements and prevent further environmental harm, the maximum annual supply of surface water for mine rehabilitation would need to be no more than the power stations' annual net usage (**Figure 10.8**), and may need to be limited to a smaller volume.

Table 10.4: Bulk entitlements in the Latrobe River system for electricity generation#

Entitlement	Holder	Blue Rock Reservoir		Lake Narracan		Annual entitlement (ML)	Average water availability with post-1997 inflows (ML/year)*
		Share of inflows (%)	Capacity share (%)	Share of inflows (%)	Capacity share (%)		
Yallourn	Energy Australia	15.72	15.72	22.41	29.94	36,500	29,200
Loy Yang A	AGL	17.22	17.22	24.55	32.80	40,000	32,000
Loy Yang B	SRW for Alinta	8.61	8.61	12.28	16.40	20,000	16,000

Excludes water supplied for electricity generation under Gippsland Water's bulk entitlements. Gippsland Water historically supplied approximately 20 gigalitres per year in total of water for electricity generation at Hazelwood Power Station and Morwell Power Station and Briquette Factories. In addition, Gippsland Water continues to provide approximately 2.7 gigalitres per year in total of water to Yallourn, Loy Yang A and Loy Yang B power stations for processes that require high water purity.

* Represents the volume of water that the electricity generator could take every year under its bulk entitlement with 100% reliability (i.e. this volume is available every year for use, even in extreme drought), assuming a typical demand pattern. It reflects the conservative management of these entitlements to provide the ultra-high reliability of supply needed for electricity generation — 'to keep the lights on across Victoria'. Electricity generators typically hold some of the water available under their bulk entitlements in Blue Rock Reservoir to manage the risk of future drought and ensure water availability for generation in following years. In wet years their capacity share of Blue Rock Reservoir will be full, and their inflows will spill from the reservoir. Average water availability is calculated based on the water allocation model. This water is typically used in cooling towers.

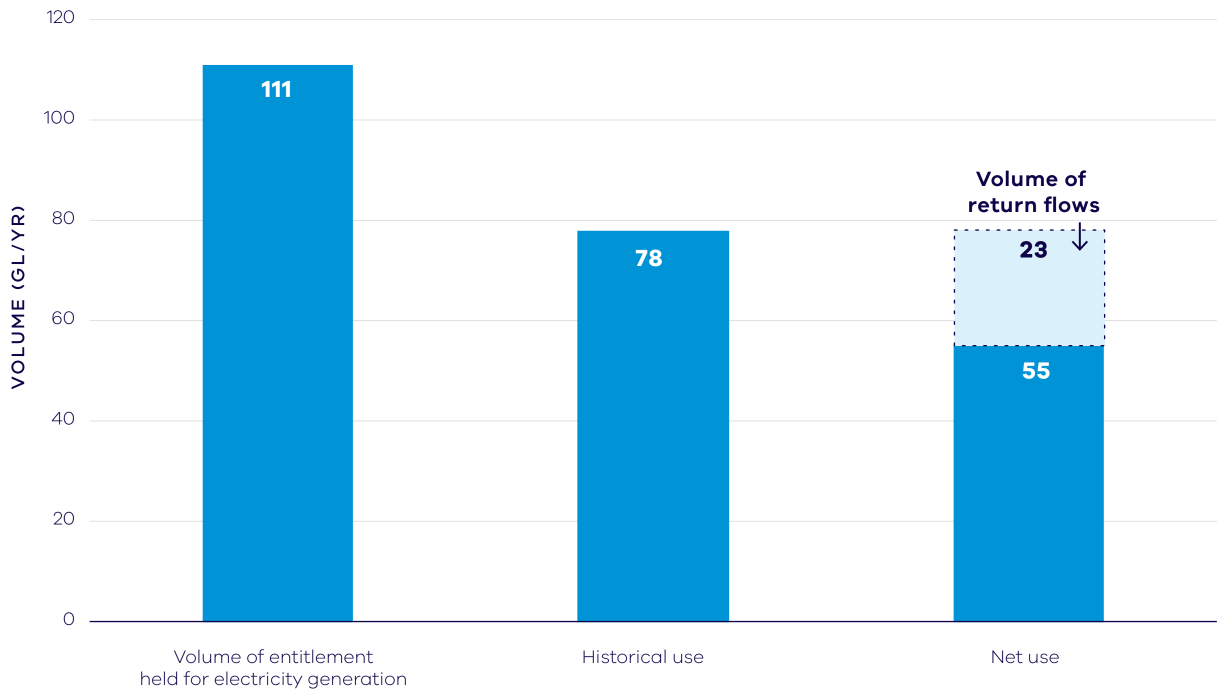


Figure 10.8: Latrobe Valley electricity generators/mine licensees' net water use between 2006–07 and 2018–19[28]

Some water from the Latrobe River system will be required for electricity generation for some time yet. However, during the transition away from coal-fired electricity generation in the Latrobe Valley over the coming decades, there will be opportunities to review how water is allocated and managed. These decisions will draw upon the work currently under way as part of the Latrobe Valley Regional Rehabilitation Strategy, to better understand rehabilitation options and the other potential needs in the basin.

Proposed direction 10-2:

- **The Victorian Government proposes to provide guidance and an improved information base to electricity generators/mine licensees to inform mine rehabilitation planning through the implementation of the Latrobe Valley Regional Rehabilitation Strategy. This includes further information on water- and non-water-based mine rehabilitation approaches, including an assessment of the feasibility of using a climate-resilient water supply, such as recycled water.**

28 Volume of water available for electricity generation compared to electricity generators'/mine licensees' actual use and net use between 2006 and 2019 includes Hazelwood Power Station and mine, Yallourn Power Station and mine, and Loy Yang Power Station and mine. Does not include Morwell Power Station and briquette factories or the Latrobe Loy Yang 3/4 Bench bulk entitlement. Supply to Hazelwood Power Station was under Gippsland Water's bulk entitlements and not under a specific entitlement for electricity generation.

Latrobe Reserve

The purpose of the Latrobe Reserve is to underpin security of supply in the Latrobe system during periods of water shortage, by providing volumes of temporary water for purchase by Latrobe system entitlement holders. This is particularly important to protect Victoria's energy security, because coal-fired electricity generation requires a water supply of the highest possible reliability. The Latrobe Reserve bulk entitlement was established under the 2011 Gippsland Regional Sustainable Water Strategy. It consists of an 18.87 per cent inflow and storage share of Blue Rock Reservoir (storage capacity equates to 37.4 gigalitres).

The Latrobe Reserve also supports the recreational rules for Lake Narracan (to facilitate waterskiing), by providing water to offset any losses resulting from these rules. Water from the Latrobe Reserve has been a critical source of water for successful waterskiing events on Lake Narracan. Without this water being available to mitigate any disadvantage to entitlement holders, it would not be possible to keep Lake Narracan at storage levels suitable for waterskiing.

The Latrobe Reserve bulk entitlement requires the Department of Environment, Land, Water and Planning to review the past performance and existing management arrangements of the Latrobe Reserve by October 2021. The review has commenced, and the Department of Environment, Land, Water and Planning is working with Southern Rural Water (manager of the reserve and holder of the bulk entitlement) to assess whether the existing management arrangements maximise the benefits to the Latrobe system entitlement holders, and to develop recommendations for potential improvements to its operations that could increase the benefits to entitlement holders. No new or different uses of the Latrobe Reserve are being considered in the review.

For as long as coal-fired electricity generation continues in the Latrobe Valley, the Latrobe Reserve will remain an important safeguard to protect the ultra-high reliability of supply for electricity generation and industry — as well as other uses — against water shortages. However, just as when the Latrobe Reserve was established, government recognises the need for flexibility to adapt water management to significant changes in water demand in the Latrobe Valley, including the gradual transition away from coal-fired electricity generation.

A review of future needs for the Latrobe Reserve in its current form is proposed within five years, to align with the closure of the Yallourn Power Station in 2028. The review might make recommendations that respond to changes in water use in the Latrobe system, including the consequences of the closure of power stations, and to water availability due to a drying climate.

Proposed direction 10-3:

- **The Victorian Government proposes to undertake a review of the Latrobe Reserve in its current form within five years, to evaluate the future need for the reserve as the Latrobe Valley transitions away from coal-fired electricity generation.**

The Victorian Government recommits to the Latrobe Reserve arrangements continuing to support recreational uses of Lake Narracan for waterskiing. These arrangements will be part of the next review.

A staged, broad-scale redesign of the Latrobe River system

Much of the Latrobe Valley water supply system has been designed to provide large volumes of ultra-high-reliability water for electricity generation, and for coal mining. In the long term, following the transition away from coal-fired electricity generation, there will be opportunities to:

- reconsider the need to retain infrastructure built to support electricity generation
- return the river to its more natural form, such as by accelerating in-channel, riparian and floodplain rehabilitation, including strategic reinstatement of river meanders
- review the way in which its water is shared.

Any redesign of this system would protect the rights of existing entitlement holders and take into account environmental, social, cultural and economic values, and the objectives of Traditional Owners and the community. The box below provides an example of how operations and infrastructure may be reimagined to provide benefits to the Latrobe Valley community.

Proposed direction 10-4:

- The Victorian Government proposes to facilitate the development of a quadruple-bottom-line vision for the future of the Latrobe Valley and Latrobe River system that is consistent with the broader vision of the Central and Gippsland Region Sustainable Water Strategy. This will encompass consideration of how the Latrobe water supply system could be redesigned and rehabilitated over time as the region makes the transition away from coal-fired electricity generation. This includes bolstering the climate resilience of irrigated agriculture, industry and the environment, and providing water access for Traditional Owners.

Proposed direction 10-5:

- The Victorian Government proposes to work with Traditional Owners to identify and pursue opportunities for Traditional Owner water entitlements and to further quantify the benefits that access to water from the Latrobe River system could provide.

Reimagining water supply to urban centres and industry

Gippsland Water supplies towns and industry in Central Gippsland with water from Moondarra Reservoir on the Tyers River. Because Moondarra Reservoir is small, in dry periods water is transferred from Gippsland Water's share of Blue Rock Reservoir to Moondarra via a water-driven turbine pump.

Operations of the Moondarra Reservoir are currently in transition as Gippsland Water's demand profile changes, and supply to two former electricity generators — Hazelwood Power Station and Morwell Power Station and briquette factories — has ceased. Looking forward, the Yallourn Power Station closure in 2028 might constrain opportunities to transfer water to Moondarra, because the turbine pump is currently driven by releases of water from Blue Rock Reservoir for power generation.

The Latrobe system redesign will include a review of the operations of Moondarra Reservoir and examination of future infrastructure needs. Opportunities to improve the operations of the Gippsland Water supply system — as well as the broader Latrobe water supply system — will be identified, in order to benefit Gippsland communities. These will include opportunities to improve environmental and Traditional Owner cultural flows in the Tyers River.

For example, construction of a pipeline to transport water from Blue Rock Reservoir directly to the Latrobe Valley could reduce reliance on Moondarra Reservoir and remove the current supply bottleneck caused by the transfer of water from Blue Rock to Moondarra. The project may boost the region's economic capacity by providing a high-quality, high-volume gravity system that delivers water efficiently, avoiding significant pumping costs, deterioration of water quality and single-system dependency. Understanding the scale of the infrastructure investment and the broader benefits this project could bring is the first step in determining whether the project could be feasible.

10.5 Cities and towns

Population growth in Warragul and Drouin has required Gippsland Water to supplement local water supplies via temporary access arrangements from neighbouring water corporations. An additional 1–2 gigalitres is currently required to secure the water supply for these towns and could potentially be sourced from Tarago Reservoir without significant impacts on other users or the environment. This gap between these townships' water demands and Gippsland Water's secure supply sources is expected to grow as the population grows.

Except for Warragul and Drouin, projected urban water shortfalls in Gippsland are not as pressing as those for Melbourne, Geelong and other townships connected to Melbourne Water's supply systems. Shortfalls are not anticipated in the coming decade, although additional supplies will be required over the longer term. Actions to ensure safe, reliable and affordable water supplies for the towns across Gippsland will be included in the Urban Water Strategies currently being prepared by Gippsland Water, South Gippsland Water and East Gippsland Water. These water corporations supply water to households as well as many important industrial and commercial users across Gippsland, and in some cases these non-residential demands make up more than 75 per cent of the water provided to the town. In these areas, programs targeted at water efficiency and diversification of water supplies to sources that are fit for purpose will help reduce pressure on local supplies. Opportunities to improve water efficiency activities across both residential and non-residential demands are explored in **Chapter 5**, and will be implemented in the Gippsland Region.

Collaborative and place-based water management planning and delivery are being undertaken by the Gippsland and East Gippsland integrated water management forums. Projects have ranged from identifying opportunities for integrated water management plans, to stormwater and drainage management interventions. One of the supported projects is Warragul's Western Park Stormwater Harvesting Project highlighted in **Chapter 5**; another is recycled water supply in South Bairnsdale (see the box below about recycled water for South Bairnsdale).

Recycled water for South Bairnsdale

This collaborative project is investigating alternative sources of water for the East Gippsland Livestock Exchange and the adjacent Bairnsdale City Oval. After the best solution is determined, infrastructure will be constructed to complement newly captured rainwater and supply recycled water, replacing the use of reticulated town water by chosen sites. This project will reduce water costs, increase recreational and environmental amenity and make the best use of available water supplies. There is potential for this to be extended in future to irrigate additional parks in Bairnsdale and further avoid drinking water use.

Proposed direction 10-6:

- **The Victorian Government proposes to secure Warragul and Drouin's urban water supply by increasing Gippsland Water's access to water from Tarago Reservoir.**

Proposed direction 10-7:

- **The Victorian Government will continue to support integrated water management forums and projects within the Gippsland region to support water security issues and help deliver more liveable regional cities and towns.**

10.6 Water Justice for Traditional Owners

Traditional Owners have a responsibility to care for Country, including lands and waters. When Country is healthy and cared for, it supports healthy people and healthy economies, which benefits everyone in the region. Traditional Owners with Registered Aboriginal Party status in Gippsland include the Bunurong Land Council Aboriginal Corporation and the Gunaikurnai Land and Waters Aboriginal Corporation.

Traditional Owners have strong interests in, and cultural connection with, all waterways on Country. In addition, the increasing salinity in the Gippsland Lakes and fringing wetlands, including the Lower Latrobe Wetlands, is of major concern. See **Section 4.2** for the contributions of the Bunurong Land Council Aboriginal Corporation and Gunaikurnai Land and Waters Aboriginal Corporation to the discussion draft Strategy.

This Strategy will play a significant role in returning water to Traditional Owners, as well as strengthening and developing agreement-making between Traditional Owner groups and water authorities, and other government agencies. The new unallocated water policy described in **Section 8.4** will enable a proportion of the small volumes of water that remain available for allocation for consumptive purposes in Gippsland to be made available to Traditional Owners. Over time, there may be further opportunities to return river water entitlements from water corporations to Traditional Owners as new manufactured sources of water add to the region's water supplies (see **Section 8.1**). Water entitlements that support critical agricultural industries in the region will be maintained.

The Victorian Government proposes to return water to the Gunaikurnai from rivers within their Registered Aboriginal Party boundary, including:

- making available a portion of the unallocated surface water in the Tambo River and South Gippsland catchments (including Albert River)
- making available a proportion of any surplus water from the Latrobe Loy Yang 3/4 Bench bulk entitlement (see **Section 10.4**)
- freeing up water in the Thomson Reservoir when other new sources are brought online for Melbourne.

The Victorian Government proposes to return water to the Bunurong from rivers within their RAP boundary, including:

- making available a portion of the unallocated water in South Gippsland catchments (including Powlett River)
- freeing up water if other new sources are found for South Gippsland Water or Westernport Water in the future.

Image: Small falls, Macailister River, Maffra West Upper, Gunaikurnai Country

10.7 Water for agriculture

Agricultural producers in the Gippsland Region are already being affected by climate change, including the continuing effects of the most recent drought. Farmers are experiencing warmer temperatures, and less water is available for their businesses.

In this context, the Victorian Government is working with farmers to encourage more efficient use of water in agriculture, including improvements to off-farm infrastructure and on-farm land and water management.

The Victorian Government has been targeting investment in rural water infrastructure projects that support resilient and productive regional communities. In recent years, co-investment between the state and rural water customers, together with contributions from the Australian Government, has brought the greatest benefit to Victoria from rural water projects, including modernisation of the Macalister Irrigation District. Phases 1 and 2 of MID2030 (a program of irrigation infrastructure modernisation) are already demonstrating significant benefits for local irrigators, and will save approximately 30 gigalitres of water for irrigation and 1.7 gigalitres for the environment. The modernisation is increasing water delivery efficiency from less than 60 per cent to an expected 80 per cent across the system.

In the region there could be further opportunities to modernise rural water infrastructure to achieve many benefits, including further upgrades in the Macalister Irrigation District.

Proposed direction 10-8:

- **The Victorian Government proposes to investigate future opportunities to improve the efficiency of rural water infrastructure, in ways that will benefit irrigators, the environment and regional communities.**

The Victorian Government and Southern Rural Water are working with stakeholders to investigate opportunities for irrigation development in Central Gippsland. The Southern Victorian Irrigation Development project is identifying where agricultural production could be sustainably developed in the region with available water, now and in the future, supporting regional economic growth. The project has highlighted feasible concept designs in two important locations:

- *Latrobe River focus area* — an area of up to 30,000 hectares along the lower Latrobe River from Yallourn to Longford would be suitable for irrigation, providing an opportunity to boost economic development and employment in the region through the dairy, beef and fodder industries. Work to date suggests that there is demand for water for agriculture, and that private industry is willing to pay and invest if water can be made available
- *Avon River focus area* — an area of around 6,000 hectares along the Avon River to the east of the Macalister Irrigation District would be viable for high-value vegetable and dairy production. Through the construction of infrastructure that would also improve service levels for areas of the district, water could be supplied from the Macalister system to new areas where these industries have indicated they are ready to invest.

Proposed direction 10-9:

- **The Victorian Government proposes to work with Southern Rural Water to identify the next steps for the Latrobe River focus area and the Avon River focus area, which could include consideration of available water sources and development of detailed business cases for infrastructure.**

Over the past 30 years, the Sustainable Irrigation Program has helped to manage the potential negative impacts of irrigation on the environment, and to build the resilience of the sector by helping irrigators adopt best-practice management and increase their water-use efficiency. The Victorian Government will ensure the continued success of the Sustainable Irrigation Program to use water wisely while protecting and improving the environment through regional investment, and updating existing programs to respond to emerging risks, including through the implementation of the Lake Wellington Land and Water Management Plan.

10.8 Managing the Mitchell: water for Traditional Owners, environment, agriculture, industry and towns

The Mitchell River is an unregulated system, with large flow volumes during winter and only a small proportion (less than 5 per cent) allocated for irrigated agriculture and supply to towns (including Bairnsdale and Paynesville).

The 2011 Gippsland Sustainable Water Strategy identified 6 gigalitres of unallocated water in the Mitchell catchment as winterfill entitlement. Of this amount, 2 gigalitres has been allocated to Gunaikurnai Land and Waters Aboriginal Corporation and another 2 gigalitres was released to the market via an online auction in May 2021, leaving the remaining 2 gigalitres to be allocated at a later date.

We are already exploring whether it could be possible to allocate additional water in the system for consumptive use through winterfill licences without compromising environmental and Traditional Owner cultural values.

The yearly demand for irrigated agriculture peaks in summer, when flows in the unregulated waterway are at their lowest. This puts pressure on the ecology of the river despite the small proportion allocated for consumptive use. The river experiences some flow stress in summer, and the recommended minimum flows and spring/summer freshes are not always met.

Unlike in other parts of Victoria, irrigators in the Mitchell system have access to 'sales water' during summer to meet irrigation demands. Sales water provides the ability for entitlement holders of a standard all-year-round direct-pumping licence to obtain water above their licensed volume during periods when rosters and restrictions are not applied. The use of sales water by Mitchell River irrigators is greatest when dry conditions prevail and more water is required for irrigation.

Current water management arrangements hinder farmers from planning for and managing risks associated with matching water supply with their irrigation demand. Having recently endured an extended dry period and drying conditions associated with climate change, irrigators need the ability to better manage their own risks.

Image: Mitchell River Gunaikurnai Country

Reforms to water access arrangements in the Mitchell system are required in order to maintain and even improve the environmental health and condition of the Mitchell River, while providing opportunities for sustainable economic growth and development, and securing the long-term viability of irrigation and other water users. Traditional Owner cultural values of the Mitchell River must also be recognised. Further work is required to understand whether additional winterfill licences can be made available without posing an unacceptable risk to the environment and Traditional Owner cultural values.

Proposed direction 10-10:

- **The Victorian Government will review the current management arrangements for the Mitchell River to meet a range of needs including agricultural, environmental and Traditional Owners, and consider whether additional winterfill licences can be made available without compromising environmental and Traditional Owner cultural values.**

10.9 Pollutant load targets

The Gippsland Lakes, Corner Inlet and Nooramunga have important recreational, agricultural, cultural and environmental values that are being impacted by inadequate water quality.

The State Environment Protection Policy (Waters) identified significant threats to water quality from nutrient pollutant loads for Lake Wellington, Corner Inlet and Nooramunga. Meeting the policy's pollutant load targets for these bodies of water (which are now in the 2021 Environment Reference Standard (Part 5 — Water)) is a high priority.

Intensive agriculture can contribute to nutrient loads and sediment run-off in the Lake Wellington catchment. The Sustainable Irrigation Program provides information, extension and incentives to irrigators in the Macalister Irrigation District and surrounds to reduce off-site effects of irrigation and support best-practice land and water management. Implementation of the Gippsland Lakes Ramsar Site Management Plan is also contributing towards reduced nutrient loads entering Lake Wellington. The Environment Reference Standard states that, to meet pollutant load targets, annual loads entering Lake Wellington between the years 2018 and 2030 must be progressively reduced, so that average annual loads beyond 2030 do not exceed 100 tonnes.

This requires a reduction in average annual load of 15 tonnes by 2030, which equates to an average reduction of at least 1.25 tonnes every year between 2018 and 2030, accounting for variation in annual loads due to variations in rainfall and flows.

Proposed direction 10-11:

- **The Victorian Government proposes to implement plans and undertake management actions to help reach the pollutant load targets outlined in the Environment Reference Standard for Lake Wellington, Corner Inlet and Nooramunga, including through implementation of the Lake Wellington Land and Water Management Plan under the Sustainable Irrigation Program.**

Table 10.5: State Environment Protection Policy (Waters) maximum pollutant load targets (phosphorus) for Lake Wellington

Location	2017 baseline total load (average annual tonnes)	Target total load (average annual tonnes)	Year by which target to be achieved
	Phosphorus		
Lake Wellington	115	100	2030

Table 10.6: State Environment Protection Policy (Waters) maximum pollutant load targets for Corner Inlet and Nooramunga

Location	2017 baseline total load (average annual tonnes)	Target total load (average annual tonnes)	Year by which target to be achieved
	Nitrogen		
Corner Inlet	105	90	2033
Nooramunga	75	68	2033
	Phosphorus		
Corner Inlet	19	16	2033
Nooramunga	7	6	2033
	Total suspended solids		
Corner Inlet	2,050	1,800	2033
Nooramunga	1,820	1,730	2033

10.10 Water for the environment and the Gippsland Lakes

Maintaining the health of rivers, wetlands and inlets is very important for the Gippsland Region. Most rivers in West and South Gippsland, and some in East Gippsland, are flow-stressed, meaning they do not have enough water to support their environmental and Traditional Owner cultural values (including assets listed under the Ramsar Convention, *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) and *Flora and Fauna Guarantee Act 1988* (Vic)).

This stress predominantly affects summer and autumn flows in unregulated streams, and year-round flows in regulated streams. Flow stress results from the regulation and/or extraction of water for urban, electricity generation and agricultural use, and from reduced run-off into waterways from catchment interception (such as small catchment dams and forestry plantations — see **Section 8.5**). The cumulative harm caused by consumptive water use and extraction on the receiving waters of the Gippsland Lakes and their fringing wetlands is significant, including harm to Ramsar site values from increasing salinity at Lake Wellington.

In a drying climate it is more important than ever to make the best use of all sources of water in local supply systems to improve waterway health and achieve shared benefits.

There are identified deficits in water available for the environment in the Thomson, Macalister and Latrobe basins, meaning that more water is required to maintain minimum environmental standards that will ensure healthy waterways in the future.

A wide range of environmental, social, economic and cultural assets will be at increased risk if environmental water deficits are not addressed, including:

- Ramsar-listed wetlands
- common, threatened and recreationally valuable fauna and flora species
- locations and species of cultural importance to Traditional Owners
- valuable farming land, irrigation infrastructure and town water supply
- places of social and recreational value
- ecosystem resilience to climate change and extreme events (such as fire, flood and drought).

Major threats to the environmental values of these systems include:

- surface water diversions, which reduce river flows, and in turn cause:
    - overall reduced annual flow volume
    - reversed flow seasonality in regulated rivers (higher summer flows and lower winter flows)
    - lost lateral connectivity between river channel and floodplains and adjacent wetlands.
- instream structures such as Maffra Weir — these impede fish passage and threaten longitudinal connectivity, preventing upstream and downstream migration for native migratory fish species
- poor water quality, due to nutrient run-off and inadequate flows.

In the future, an essential task will be the protection of areas that currently have high-quality natural environments from the effects of climate change and extreme events (such as flood, drought and fire) and resultant decline in available water.

West Gippsland Catchment Management Authority, Southern Rural Water, Gippsland Water and Melbourne Water are collaborating to identify and assess potential short-term and longer term ways to recover water for the environment and Traditional Owners in Gippsland. This work is still in its early stages, but should continue as part of the Water Supply Readiness Roadmap (see **Chapter 6**) and finalisation of this Strategy, so that it is integrated with consideration of future water supply options for all water users across the region and appropriate quadruple-bottom-line assessments are completed for all potential options. The options listed below are those identified to date as consistent with the proposed directions in this discussion draft Strategy. They result from preliminary, incomplete work, and are therefore not exhaustive. For this reason, specific volumes have not yet been attributed to any option, and will be subject to further detailed assessment.

The remainder of this section identifies the water recovery targets (**Table 10.7**) and how they could be achieved for the Latrobe, Thomson, Macalister and Tyers rivers.

Proposed direction 10-12:

- **The Victorian Government proposes to develop water recovery targets for other flow-stressed rivers, estuaries and wetlands of the Gippsland Lakes and across South Gippsland, including the Avon River, Latrobe/Thomson estuary and Lower Latrobe Wetlands.**

Proposed direction 10-13:

- **The Victorian Government proposes improvements to water management in the Thomson, Macalister, Latrobe and Tyers rivers for the environment, Traditional Owner cultural values and other shared benefits within five years.**

This could be achieved through a combination of:

- temporary transfers of water to the Victorian Environmental Water Holder or Traditional Owners when conditions allow
- flexible and efficient operations.

Table 10.7: Water recovery targets for the Gippsland Region

River	Outcome	Water recovery target (ML/yr)	Maximum timeframe
Thomson River	Prevent critical loss of species	8,000	5 years
	Regular breeding and recruitment of the threatened Australian grayling and other native fish	15,000	10 years
	Long-term protection of priority environmental values	31,000	50 years
Macalister River	Prevent critical loss of species	6,000	5 years
	Regular breeding and recruitment of the threatened Australian grayling and other native fish Enable plant propagule dispersion	12,600	10 years
	Long-term protection of priority environmental values	29,000	50 years
Latrobe River	Deliver (currently deliverable) priority flows to provide population expansion opportunities of species in summer and autumn Maintain water quality and habitat Support drought refuge Prevent critical loss of species	1,500	5 years
	Regular breeding and recruitment of the threatened Australian grayling and other native fish Support expansion of native fish populations	4,400	10 years
	Long-term protection of priority environmental values	89,000	50 years
Tyers River	Full delivery of minimum flows Maintain water quality Prevent critical loss of species	12,500	5 years
	Provide opportunities for population expansion for native fish and other fauna in summer and autumn	17,600	10 years
	Long-term protection of priority environmental values	48,000	50 years

* Water recovery target volumes do not include full volumes required for the Latrobe estuary or Lower Latrobe Wetlands.

^ Water recovery for the Tyers River may also help meet some of the water recovery targets for the Latrobe River below its confluence with the Tyers River. Analysis would need to be done to quantify this. It would depend on the coincidence of the flows that each target aims to achieve.

Over the past two decades, catchment management authorities have been implementing programs in collaboration with government, landholders and other organisations and individuals, in order to improve the health of waterways. These programs are helping to reverse more than 150 years of damage caused by unsustainable land and water use and methods, including clearing native vegetation, straightening river channels, removing woody habitat ('snags') and extracting water, all of which have harmed native plants and animals and degraded our waterway environments. The Victorian Government will ensure the continued success of the Victorian Waterway Management Strategy by continuing to invest in regional waterway management that is led by catchment management authorities working with partners that include Traditional Owners, landholders, other agencies and community members.

The remainder of this sections sets out a range of complementary works for each of the major waterways in the Gippsland sub-region..

Thomson River

Proposed direction 10-14: Thomson River

- **The Victorian Government proposes additional water for the environment of up to 8,000 megalitres per year for the Thomson River within five years, to prevent critical loss of species.**

Proposed direction 10-15: Thomson River

- **The Victorian Government proposes further additional water for the environment of up to 7,000 megalitres per year for the Thomson River within 10 years, to improve waterway health by supporting migratory native fish populations, including the vulnerable Australian grayling.**

The short- and long-term water recovery targets could be achieved through a combination of:

- allocating a share of river water to the environment when new sources are brought online for Melbourne
- water-use efficiency savings from consumptive uses.

It is important to note that these options are preliminary only and need significant investigation to determine whether they are feasible and what volumes they could provide for the environment.

Image: Thomson reservoir

Thomson River–Rainbow Creek Management Plan

The Thomson River and Rainbow Creek anabranch is one of the large-scale restoration projects under the Victorian Government's Flagship Waterway program. The waterway supports significant environmental, economic, cultural and social values. It provides a nature corridor between the Gippsland Lakes and the Alpine region, and boasts healthy numbers of native fish species. It supplies local towns with drinking water and the Macalister Irrigation District with high-quality irrigation water. However, the site is at risk of the river changing course and carving a large new channel (an avulsion) across irrigated farming land, which would significantly harm productivity, rural and urban water supplies, and the Gippsland Lakes.

In 2019 a Waterway Management Plan was developed in collaboration with the local community, technical experts and agency representatives. The West Gippsland Catchment Management Authority worked closely with the local community and agencies to ensure that the plan recorded, considered, and responded to the aspirations and concerns of the community. The plan sets out a vision for the waterway and identifies management actions that are needed to meet the environmental, social and economic objectives. These are supported by a rigorous cost–benefit assessment that demonstrates a positive return on investment.

The management actions are directly linked to the strengthening of environmental and social values, and the reduction of significant economic, social and environmental risks if the river changed course. These actions are:

- 5 avulsion 'hotspots' treated with rock armouring
- 52 hectares of willow removal
- 35 kilometres of riparian fencing
- 52 hectares of native riparian revegetation
- 30 off-stream water troughs
- 135 hectares of maintenance
- treatment of high-risk instream blockages as required
- Rainbow Park (Cowwarr) amenity works.

The Victorian Government is investigating options to implement the Thomson River–Rainbow Creek Management Plan, ensuring water security and maintaining water quality for the region.

Macalister River

Proposed direction 10-16: Macalister River

- **The Victorian Government proposes additional water for the environment of up to 6,000 megalitres per year for the Macalister River within five years, to improve waterway health by preventing loss of species.**

Proposed direction 10-17: Macalister River

- **The Victorian Government proposes further additional water for the environment of up to 6,600 megalitres per year for the Macalister River within 10 years, to improve waterway health by supporting migratory native fish populations and enabling plant propagule dispersion.**

These water recovery targets could be achieved through a combination of:

- achieving committed water savings from Phase 2 of MID2030
- investigating other modernisation options in the Macalister Irrigation District and the potential to share any associated water savings with the environment.

Periods of very low inflows to Lake Glenmaggie are becoming more frequent and protracted. These result in periods of very low flow passing Maffra Weir. For example, in the hot, dry summer of 2018–19, inflow to Lake Glenmaggie fell to 0 megalitres per day, triggering a corresponding requirement for no passing flow below Maffra Weir. To ensure that the Lower Macalister River continued to flow and maintain aquatic life, West Gippsland Catchment Management Authority (with Victorian Environmental Water Holder support) varied its seasonal water planning. Water available under the Macalister River environmental entitlement was used to sustain low flows below Maffra Weir, instead of using it on the freshening flows as originally planned.

There are potentially many beneficiaries of passing flows, including residents of Maffra (Gippsland Water diverts water from Maffra Weir for urban users), and domestic and stock users below the weir. Equally, holding as much water as possible in Lake Glenmaggie underpins security of supply for irrigators in the Macalister Irrigation District.

Proposed direction 10-18: Maffra Weir

- **The Victorian Government proposes to review passing flows at Maffra Weir to identify opportunities to optimise the benefits of passing flows for all users.**

Maffra Weir remains a significant barrier to both migratory and non-migratory native fish species in the Macalister River. Due to the river's high-quality habitat and diversity of migratory fish, the weir remains one of the most significant fish barriers in coastal Victoria.

Re-establishing connectivity at Maffra Weir is expected to greatly improve the abundance, distribution and diversity of native fish species in the Macalister and broader Gippsland catchment. It would give native fish access to 34 kilometres of high-value refuge upstream of Maffra Weir, which has been fully restored through revegetation and riparian fencing programs and provides continuous wetted habitat due to irrigation. Installation of a fishway at Maffra Weir would maximise the benefits of the existing environmental entitlement, the additional 1.7 gigalitres of water to be recovered through MID2030 Phase 2, and any future water recovery.

Proposed direction 10-19: Maffra Weir

- **The Victorian Government proposes to construct a fishway at Maffra Weir.**

Latrobe River

Proposed direction 10-20: Latrobe River

- **The Victorian Government proposes additional water for the environment of up to 1,500 megalitres per year for the Latrobe River within five years, to improve waterway health by preventing loss of species.**

These water recovery targets could be achieved through:

- options for a share of surplus water from the Loy Yang 3/4 Bench bulk entitlement to contribute towards meeting environmental water recovery targets.

Proposed direction 10-21: Latrobe River

- **The Victorian Government proposes further additional water for the environment of up to 2,900 megalitres per year for the Latrobe River within 10 years, to improve waterway health by providing opportunities for population expansion of native fish and other fauna species.**

These water recovery targets could be achieved through a combination of:

- options for a share of surplus water from the Loy Yang 3/4 Bench bulk entitlement to contribute towards meeting environmental water recovery targets
- recovering or substituting water for the environment or for offsetting environmental effects on waterways through integrated water management projects

- returning a share of river water to the environment each time new major water sources are brought online or a bulk entitlement is no longer required.

Achieving the larger environmental flows needed for the environment and to support cultural values in the Latrobe River and estuary is made more difficult by the river's much smaller channel capacity immediately upstream of the Thomson River confluence. Environmental flows cannot be achieved without affecting other water users, such as by inundating private land. Options to solve such problems may include infrastructure, financial incentives and/or land purchase. Overcoming the constraints will extend benefits to the upstream reaches of the Latrobe and to the Latrobe Estuary.

Proposed direction 10-22:

- **The Victorian Government proposes to remove constraints to the delivery of water for the environment in the Latrobe River downstream of Rosedale.**

There are significant salinity problems across the Gippsland Lakes system, largely due to the permanent opening of the entrance to the ocean in 1889, river regulation, consumptive water use and climate change (whose effects include reduced river flows, increased evaporation and sea-level rise). These pressures extend to the Lower Latrobe Wetlands, where cycling salinity levels are largely determined by the amount of freshwater flowing in from the Latrobe, Macalister and Thomson rivers.

Protection of the freshwater-dependent values of the Lower Latrobe Wetlands is a high priority in the Gippsland Lakes Ramsar Site Management Plan, and also for the Gunaikurnai and the local community.

Construction of new and upgrading existing watering infrastructure (regulators) to the Lower Latrobe Wetlands will provide freshwater inflows effectively and efficiently. This will preserve and strengthen freshwater-dependent values in these wetlands in the medium term, and allow time to plan for the long term, in accordance with Australia's international obligations under the Ramsar Convention.

The proposed infrastructure includes:

- installation of a new regulator for Sale Common at McArdles Gap (on the Thomson River)
- a new inlet regulator for Heart Morass
- a new inlet regulator for Dowd Morass.

Upgrades are also proposed for structures at Dowd Morass and Sale Common, as shown in **Figure 10.9**.

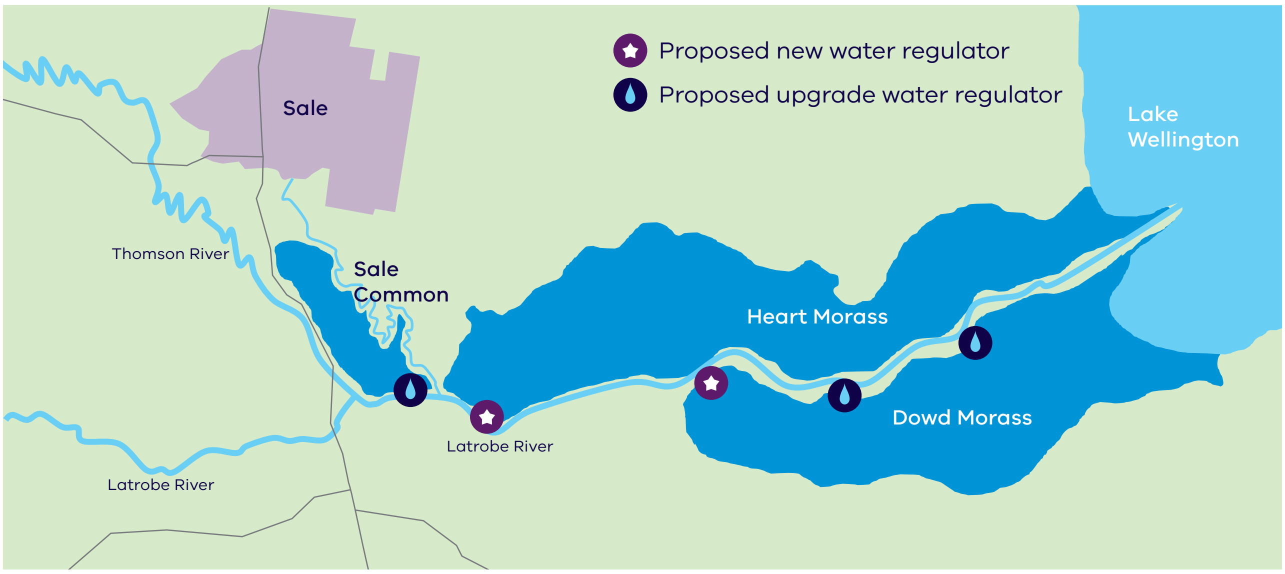


Figure 10.9: Proposed new and upgraded water-regulating structures in the Lower Latrobe Wetlands

Image: Latrobe river, Sale, Gunaikurnai Country

Proposed direction 10-23:

- **The Victorian Government proposes to construct new and upgrade existing watering infrastructure (regulators) to the Lower Latrobe Wetlands.**

Tyers River

Proposed direction 10-24: Tyers River

- **The Victorian Government proposes additional water for the environment of up to 12,500 ML/yr for the Tyers River within five years to improve waterway health by preventing critical loss of species.**

These water recovery targets could be achieved through a combination of:

- investigating infrastructure options to improve the water delivery network of the Latrobe Valley, allowing greater flexibility to efficiently move water resources from Moondarra and Blue Rock Reservoirs to consumptive demands, reducing total reliance on the Tyers River
- investigating reconfiguration of the Latrobe Valley water supply system to reduce reliance on Moondarra Reservoir for urban/industrial supply.

Proposed direction 10-25: Tyers River

- **The Victorian Government proposes further additional water for the environment of up to 5,100 megalitres per year for the Tyers River within 10 years, to improve waterway health by providing opportunities for population expansion for native fish and other fauna.**

These water recovery targets could be achieved through a combination of:

- investigating options for substitution/recovery from changes in water sharing in Blue Rock Reservoir
- reconfiguring the Latrobe Valley water supply system to reduce reliance on Moondarra Reservoir for urban and industrial supply.

The Tyers River has two barriers to fish movement below Moondarra Reservoir: first, the Tyers River pumping station Weir approximately 5 kilometres upstream of the Latrobe confluence; second, a redundant weir approximately halfway upstream to Moondarra. Removing fish barriers, and/or providing fishways, would see fish movement from the ocean to the 25 kilometres of high-quality habitat in the Tyers River below Moondarra Reservoir, increasing the distribution and abundance of at least eight native migratory species and recovery of Tyers River fish communities.

Proposed direction 10-26: Tyers River below Moondarra Reservoir

- **The Victorian Government proposes to remove barriers to fish passage, and/or provide fishways, in the Tyers River below Moondarra Reservoir.**

Nicholson River

The Nicholson Dam sits on the Nicholson River in eastern Victoria, flowing from state forest in upland areas and ending in Lake King, one of the largest of the Gippsland Lakes. The Gippsland Lakes support a diverse range of wildlife species, under national protection in the Lakes National Park and Gippsland Lakes Coastal Park. The Gippsland Lakes wetlands are protected by the international Ramsar Convention on wetlands.

The Nicholson Dam is the only major physical structure interrupting the otherwise unregulated river, preventing fish movement from the lower reaches of the river to 80 per cent of the upper reaches. The dam was constructed in 1976 (and commissioned in 1977) for drinking water supply, but due to water quality concerns was reduced to emergency supply in 1999. The bulk entitlement was transferred to the Mitchell River in 2010, rendering the dam technically redundant.

In its current condition, the Nicholson River Dam has wide-ranging effects on the health of the Nicholson River system. It also represents a liability for East Gippsland Water, and recent engineering studies have shown that the dam has an insufficient factor of safety against failure during a large flood.

Partial removal of the dam wall in the channel will immediately improve connectivity and fish passage, and over time will restore habitat complexity as a more natural flow regime and sediment disturbance are returned to the river. This will restore the

Nicholson River to near-natural condition, and will allow for free movement of migratory fish species, including the vulnerable Australian grayling (*Prototroctes maraena*), from the lower reaches of the river to 80 per cent of the upper reaches.

Removal of the dam wall is also expected to restore habitat complexity in the downstream river reaches, by restoring sediment regimes and decreasing terrestrial vegetation encroachment into the river bed, benefiting a large number of aquatic flora and fauna. It is also likely to improve opportunities for tourists and the community for recreational fishing, kayaking and waterside recreation such as bushwalking, picnicking and bird watching — with flow-on benefits to the local economy.

Proposed direction 10-27: Nicholson River Dam

- **Over the next five years, the Victorian Government proposes to work with East Gippsland Water and the East Gippsland Catchment Management Authority to improve waterway health and flows into the Gippsland Lakes, by scheduling the decommissioning of the Nicholson River Dam wall.**

Merrimans Creek

Merrimans Creek currently does not provide fish passage between the estuary and the upper reaches of the creek.

Proposed direction 10-28: Merrimans Creek

- **The Victorian Government proposes to consider options and provide fish passage along Merrimans Creek within five years, to enable fish migration and movement, and improve flows.**

Image: Nicholson River Dam wall

11. The Central sub-region

Image: Melbourne CBD over the Maribyrnong River, Wurundjeri Woi-wurrung Country

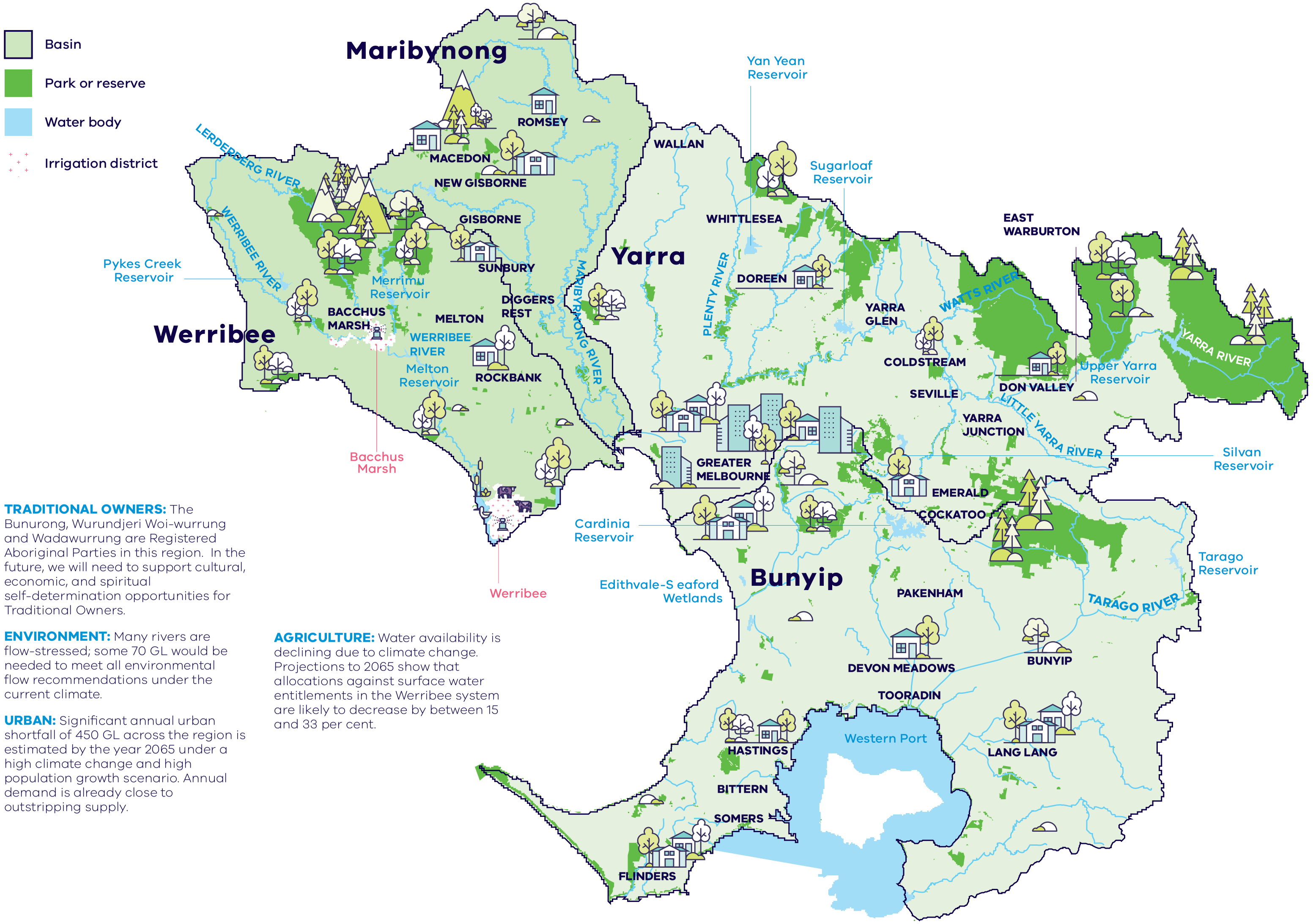
11.1 The sub-region

The waterways of Victoria's Central sub-region (the Waterways of the West including the Werribee and catchments, and those from the Yarra to Westernport) support many users, including Melbourne and its growing suburbs. The headwaters of the Yarra River are the primary supply of drinking water for Melbourne. The sub-region also supports diverse and highly productive irrigation districts, other agricultural areas, and industry. Waterways and water bodies across the sub-region are valued by the community for fishing, boating and waterside recreation. Bird-watching is very popular at the Western Treatment Plant, and the lower reaches of the Yarra River (Birrarung) include a network of parklands and popular tourist areas, both on and beside the water. The community has told us that it values the environmental condition and ecological values of these waterways.

The headwaters of many of these waterways are characterised by native vegetation. Lower reaches have been cleared for agriculture and urbanisation, with the green wedge providing important green open space surrounding Melbourne's growth boundary.

The sub-region includes significant areas of agricultural production, such as the Werribee and Bacchus Marsh irrigation districts and the Yarra Valley. Recycled water is already a significant source for the Werribee Irrigation District, but greater use of recycled water and stormwater could help support irrigated agricultural production and expansion in peri-urban areas.

The sub-region's waterways are a vital part of Country for Traditional Owners: the Bunurong, Wurundjeri Woi-wurrung and Wadawurrung peoples. Many waterways including the Werribee and Maribyrnong rivers are places of significance to the Wurundjeri Woi-wurrung and Wadawurrung, with a high concentration of significant sites and artefacts along river corridors and around wetlands. However, Bunurong Land Council Aboriginal Corporation, Wadawurrung Traditional Owners Aboriginal Corporation and the Wurundjeri Woi-wurrung Cultural Heritage Aboriginal Corporation do not currently hold any water entitlements.



TRADITIONAL OWNERS: The Bunurong, Wurundjeri Woi-wurrung and Wadawurrung are Registered Aboriginal Parties in this region. In the future, we will need to support cultural, economic, and spiritual self-determination opportunities for Traditional Owners.

ENVIRONMENT: Many rivers are flow-stressed; some 70 GL would be needed to meet all environmental flow recommendations under the current climate.

URBAN: Significant annual urban shortfall of 450 GL across the region is estimated by the year 2065 under a high climate change and high population growth scenario. Annual demand is already close to outstripping supply.

AGRICULTURE: Water availability is declining due to climate change. Projections to 2065 show that allocations against surface water entitlements in the Werribee system are likely to decrease by between 15 and 33 per cent.

Figure 11.1: The Central sub-region: showing the basins, major water uses and some of the opportunities and difficulties ahead

11.2 The challenge

The Central sub-region is facing significant problems: a drying climate, flow-stressed rivers and a need to double water supplies to meet population growth. Securing adequate water for households, businesses, farms, Traditional Owners and our local rivers will not be easy. To achieve a more secure and climate-resilient water supply system, all users must increase their efforts to use water more efficiently, we must consider various integrated water management options that in combination will offset potable demands, and the sub-region must use a greater proportion of sustainable water.

This sub-region is predicted to experience Victoria's greatest population growth, concentrated around Melbourne's western and northern growth corridors, and also through significant infill of existing suburbs. But the effects of climate change have seen the average catchment inflows in the region decline by 18 per cent since the last Sustainable Water Strategy was developed, compared with historical water availability. Dams and reservoirs are no longer providing the same reliability of water as they did in the past, and cannot provide enough water to meet future needs.

Melton and Bacchus Marsh, which rely largely on Merrimu Reservoir and a connection to the Melbourne system, cannot supply enough water for their anticipated population growth. Without a local solution, these growth areas will require expensive system upgrades to obtain additional water from the water grid. A more integrated approach is needed, to change how urban water demands are met while also providing for environmental, social and cultural values. All of this is essential if we are to achieve the best overall result for rapidly growing communities.

For Traditional Owners, the rivers of this sub-region are connected to Dreaming stories and have intangible cultural values, as well as hosting physical cultural heritage sites that are threatened and need to be protected for current and future generations. Water justice is sought through the return of water to Traditional Owners to support their cultural values. But there are limited opportunities to return water to Traditional Owners in this sub-region in the near term without affecting supplies for other users, because all surface water across the sub-region is fully allocated.

Image: Community park, in new housing development, Werribee, Bunurong Country

11.3 Water resources and uses

Major waterways of this sub-region include the Werribee (Wirribi Yaluk) and Lerderderg rivers and their tributaries, the Maribyrnong River (Mirrangbamurn) and its tributaries Jacksons Creek and Deep Creek, the Yarra (Birrarung) River, and the many waterways of the Bunyip Basin — including the Bunyip, Tarago and Lang Lang rivers and the Dandenong, Cardinia, Kananook and Eumemmerring creeks. These waterways flow into either Port Phillip Bay or Western Port.

Water use in the sub-region is predominantly for Greater Melbourne and other cities and towns connected via the water grid (**Table 11.1**). Agriculture is the largest use in the Werribee Basin, mainly in the Werribee and Bacchus Marsh irrigation districts. While on an annual average basis the proportion of a river's total flow that is extracted may appear small, the proportion extracted during the dry months of the year or during drought years can significantly affect the river.

Water supply is highly connected through the water grid, which provides water from local storages as well as drawing on the Thomson Dam and Wonthaggi Desalination Plant, and supplies across the sub-region, through the Melbourne supply system. In times of critical need the North–South Pipeline is available to carry water from the Goulburn River to Melbourne's Sugarloaf Reservoir.[29]

Victoria's two largest wastewater treatment plants are in the Central sub-region: the Western Treatment Plant in Werribee (which treats about half of Melbourne's wastewater) and the Eastern Treatment Plant in Carrum (which treats most of the remainder). Highly treated wastewater is recycled for a range of non-drinking purposes including irrigating crops and watering parks and gardens. But only a small amount of the wastewater produced is re-used, providing opportunities to extend the supply of fit-for-purpose recycled water if quality, timing, distribution and cost can be managed.

An estimated 407 gigalitres of excess stormwater produced by the Central sub-region each year can potentially be harvested and used. This excess stormwater is about 22 per cent of the total stormwater flows discharged into Port Phillip Bay and Western Port. Urban stormwater run-off is the greatest threat to the ecological health of Melbourne's waterways; it has been found to override all other causes of waterway degradation (Clearwater, 2016). Opportunities exist to increase use of stormwater to meet water needs in the region and improve waterway health.

29 Only when Melbourne's total water storages are less than 30 per cent full on 30 November of any year.

Image: Victorian Desalination Project, Wonthaggi, Bunurong Country

Stormwater

Stormwater is the single biggest threat to the environmental health of Melbourne's waterways. The effects of stormwater include:

- erosion — fast-moving urban water flows can erode waterway corridors and damage aquatic habitats
- loss of baseflow — lack of infiltration caused by impermeable surfaces reduces baseflows in waterways
- nutrients — stormwater run-off collects pollutants, including nutrients from fertilisers and pet droppings, leading to algal blooms
- other pollutants — chemicals such as pesticides and petrol can be washed into urban waterways and cause significant damage
- sediment — can block sunlight from reaching important aquatic ecosystems.

This is particular evident in the highly urbanised local waterways such as the Gardiners Creek, Merri Creek, Armstrong Creek, Lollypop Creek, and Steele Creek in greater Melbourne, and Armstrong Creek in greater Geelong.

Finally, stormwater run-off can cause flooding in urban and suburban areas.

For more information about stormwater's effects on waterway health across Melbourne, see Melbourne's Healthy Waterways Strategy: **https://healthywaterways.com.au**.

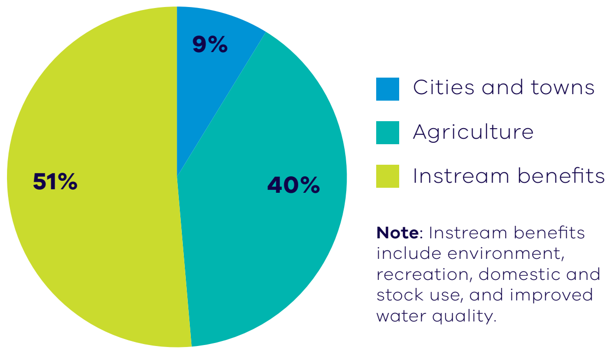
The Central sub-region includes the West Port Phillip Bay and East Port Phillip Bay groundwater catchments.[30] Licensed groundwater use here is relatively low, generally less than 10 gigalitres per year. However, it is an important supply, particularly in market gardening in Werribee and the Nepean Peninsula, watering golf grounds and the fruit-growing area around Wandin.

30 The sub-region also includes the Lancefield, Cut Paw Paw, Wandin Yallock and Nepean groundwater management areas and the Koo Wee Rup Water Supply Protection Area.

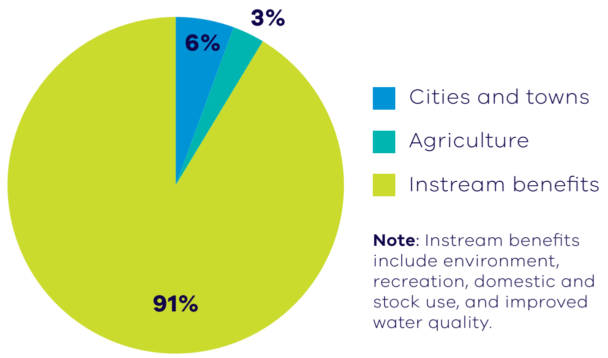
Table 11.1: **River water availability in the Central sub-region, by water user**[31]

Werribee Basin: Water use is predominantly for agricultural irrigation in the Werribee and Bacchus Marsh irrigation districts, including more than 150 vegetable farms.

The second-largest consumptive use is urban supply to the growth centres of Melton and Bacchus Marsh.

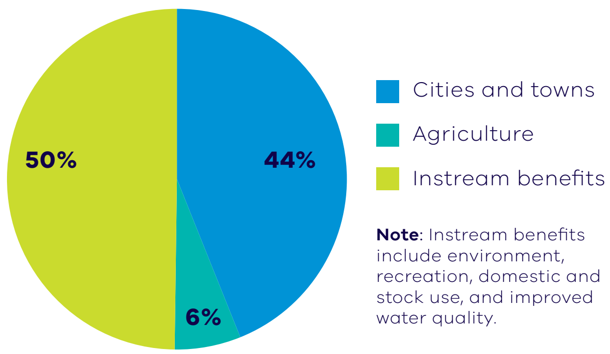


Maribyrnong Basin: Consumptive uses include urban water supply to the towns of Sunbury, Diggers Rest and Gisborne, take-and-use licences for unregulated surface water, and registered commercial and irrigation farm dams.



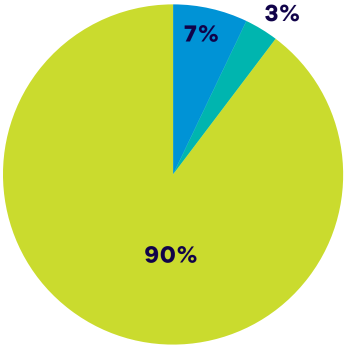
Yarra Basin: The Yarra Basin is a very important source of water supply for Melbourne — a large proportion of its water is allocated to urban use.

Other consumptive uses include private diversions for irrigated agriculture. The Yarra Basin is highly connected to the surrounding river basins through the water grid, and water from the basin can be used to supply towns and other users in the Werribee, Maribyrnong, South Gippsland and Barwon basins.



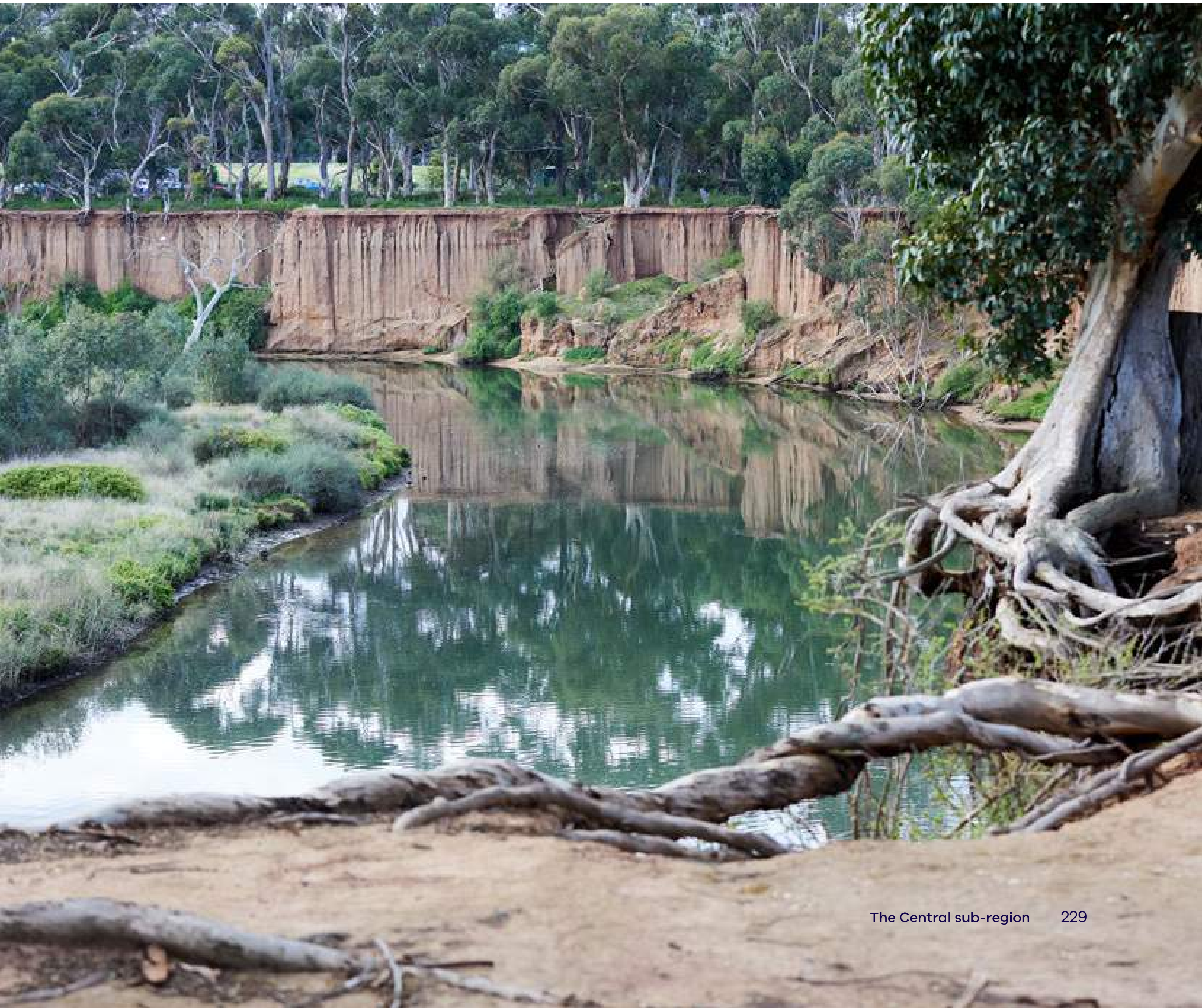
31 Excludes water use under section 8 rights.

Bunyip Basin: Water is used by Greater Melbourne and regional urban centres, and for licensed private diversion from waterways.



Note: Instream benefits include environment, recreation, domestic and stock use, and improved water quality.

Image: Werribee River at the K Road Cliffs, Werribee South, border of Bunurong Country and Wadawurrung Country



Seasonal variability

Water availability and the way water is shared are typically expressed as average annual volumes. However, both the natural flow in rivers and demands for water vary substantially between seasons each year.

For example, the Maribyrnong River's flow in winter has been six times higher than in summer between the years 2012 and 2016, despite that period including some years with low inflows (**Figure 11.2** and **Figure 11.3**).

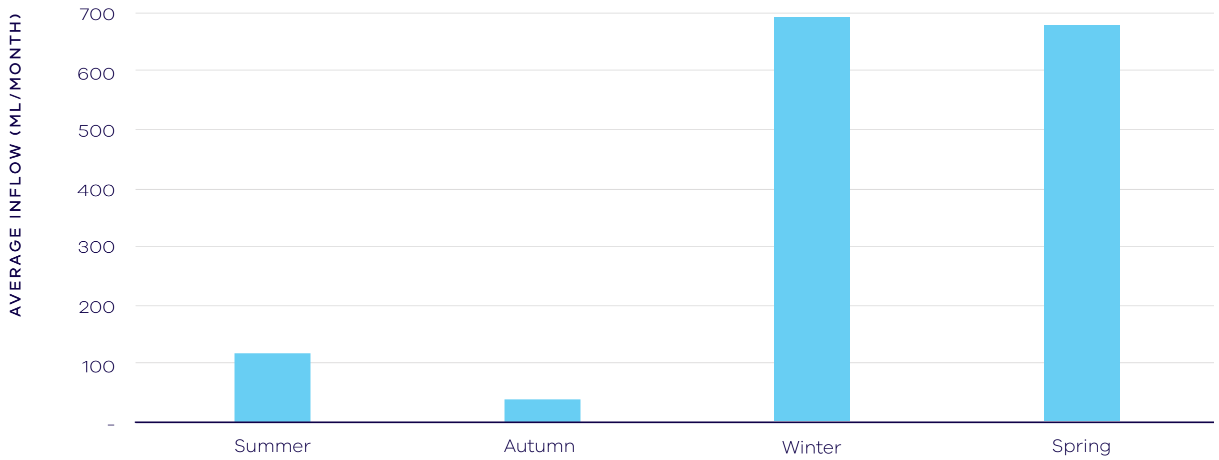


Figure 11.2: Seasonal variation in flow in the Maribyrnong River (to Rosslynne Reservoir), 2012–16

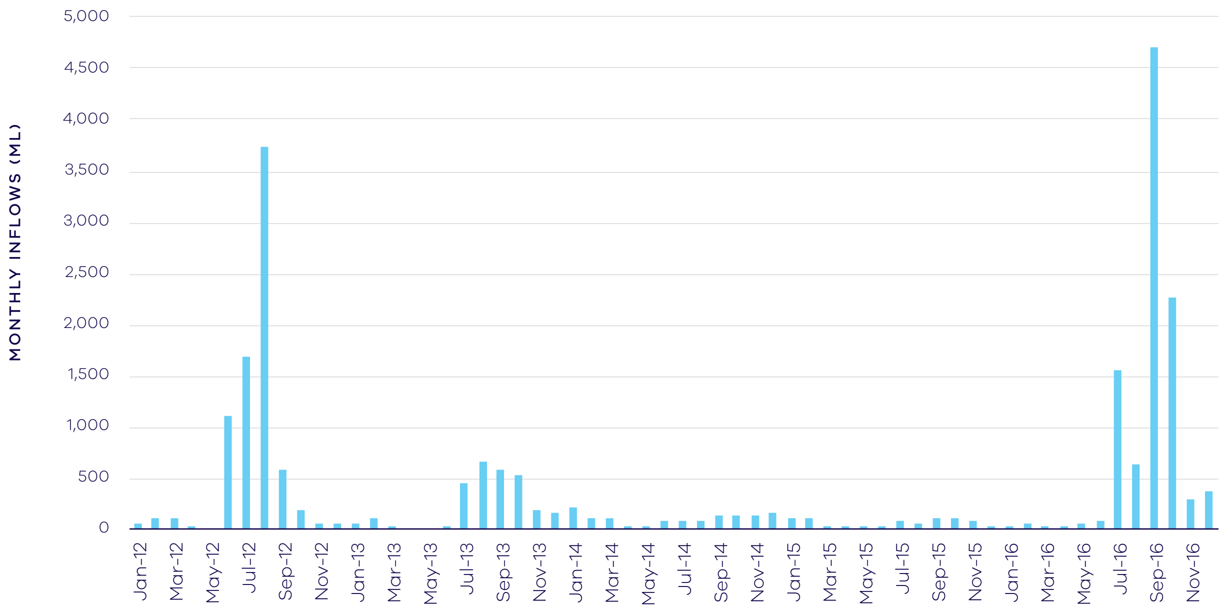


Figure 11.3: Average monthly inflows by season in the Maribyrnong River (to Rosslynne Reservoir), 2012–16

Because peak demand for water typically coincides with the summer–autumn low-flow period, even unregulated rivers with low volumes allocated to consumptive use may come under flow stress. To protect low flows, diversions for consumptive use — such as irrigation — must reduce or cease when flow in rivers falls below trigger levels. Winterfill licences restrict the taking of water to the wetter months of the year.

Melbourne's water supply

In the past, most of Melbourne's drinking water has come from the Yarra, Thomson, Bunyip and Tarago basins and the Silver and Wallaby creeks. During the Millennium Drought, the Victorian Desalination Project and the Melbourne-to-Geelong pipeline were constructed, to help cope with the drought and meet the growing water needs of Melbourne and connected towns. In 2010 the North–South Pipeline was built to carry water from the Goulburn River to Melbourne's Sugarloaf Reservoir in times of critical need.

Melbourne's water supply system can also provide supplementary supplies for those regional urban water corporations that are connected to Melbourne (Barwon Water, Greater Western Water, South Gippsland Water, Gippsland Water and Westernport Water). This is already extending the water security benefits of the Victorian Desalination Project across the region to Geelong, Korumburra, Cowes and other cities and towns in the Central sub-region.

Western Treatment Plant

The Western Treatment Plant treats about half of Melbourne's wastewater, and supports internationally recognised bird habitat at a 10,500-hectare site in Werribee. Managed by Melbourne Water, the plant supplies high-quality recycled water to Greater Western Water, Southern Rural Water and Madowla Park Holdings, who distribute it through their pipe networks to homes and businesses. Up to 11 gigalitres per year is used at the nearby Werribee Irrigation District.

The Western Treatment Plant is home to nearly 300 bird species, including internationally and nationally significant waterfowl and shorebirds, and habitat for the threatened growling grass frog. Recycled water supports critical habitat and ecosystems for these species. Protected by Commonwealth obligations, the Western Treatment Plant is recognised as a wetland of international importance under the Ramsar Convention,[32] and is one of Australia's best bird-watching sites.

In addition to meeting existing demands, the plant has the capacity to supply an extra 30 gigalitres of recycled water for re-use in the cooler/wetter season in an average year, or up to 85 gigalitres in a wet year. Sewage flows are predicted to increase by almost 1 per cent per year between now and 2070, with population growth and water efficiency measures the key factors influencing this growth rate. Based on this, an additional 20 gigalitres is likely to be available by 2036.

Use of these volumes throughout the year is constrained by limited demand in the winter months, and the logistics and expense of storing and transporting the recycled water when and to where it is needed. The relatively high levels of salt in the incoming sewage also limit recycled water use without further treatment.

32 The Ramsar Convention on Wetlands of International Importance was signed in 1971 in the Iranian town of Ramsar.

Eastern Treatment Plant

The Eastern Treatment Plant treats about 40 per cent of Melbourne's wastewater, to a very high quality that meets the requirements for discharge into the marine environment (at Boags Rocks on the southern Mornington Peninsula) and for providing Class A recycled water. Between 4 and 6 gigalitres per year of recycled water is supplied to Trility, which manages the Eastern Irrigation Scheme. Around 1.5 gigalitres per year is supplied to South East Water for a combination of uses, including residential dual pipe, irrigation and public open spaces.

In addition to meeting existing demands, the plant has the capacity to provide 100–110 gigalitres per year of recycled water for re-use, consistently through the year. There are opportunities to use recycled water from the Eastern Treatment Plant for a range of purposes including tourism, agriculture, industry, sports fields and passive open space. Examples of these in the south-east include the Dingley green wedge, Tyabb–Somerville Irrigation Scheme, Hinterland Environmental Water Scheme, and Monash and Dandenong major activity hubs. The main constraint on using more recycled water from the Eastern Treatment Plant is the high cost of building and operating the distribution network. Having a large number of users in close proximity to each other and to the plant, with consistent year-round usage, could help meet these high costs.

For additional information on water resources and uses in the Central sub-region, please refer to the **Further information** section at the end of this document.

Changes in water availability

Long-term availability of water for the environment and consumptive uses in the Central sub-region is declining (**Figure 11.4**). Total water availability has declined by between 10 and 20 per cent across all river basins when the historical inflow record used for the last Sustainable Water Strategy is compared with the 1975 baselines (DELWP, 2020b).

Image: Canoer on the Yarra River, Fairfield, Wurundjeri Woi-wurrung Country

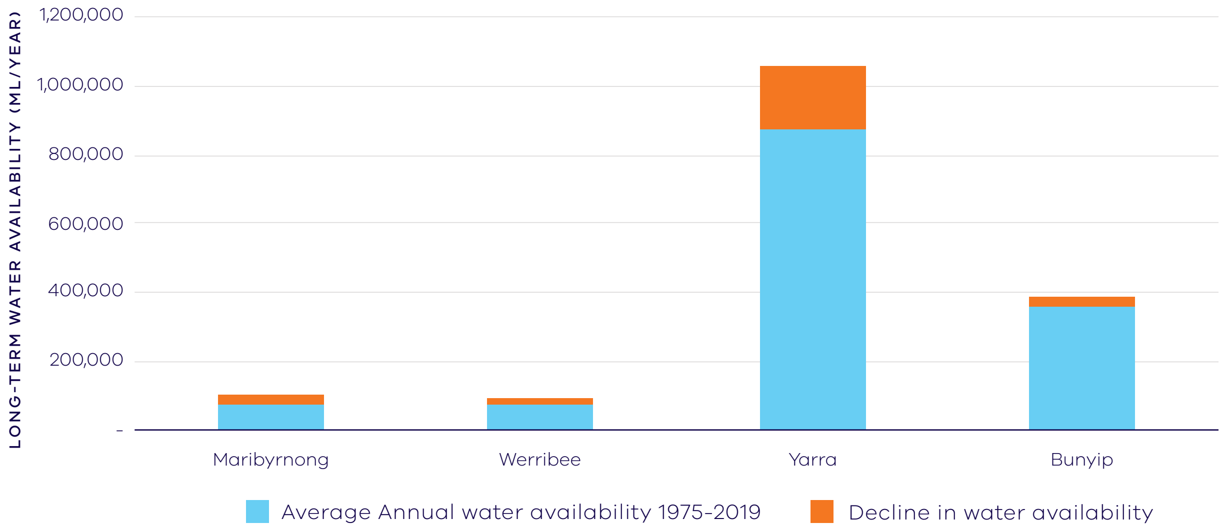


Figure 11.4: Long-term average annual water availability and decline across the Central sub-region

Future water projections

Low, medium and high climate change scenarios to the year 2065 were used to calculate potential future water availability across the Central sub-region.[33] For all basins there is a small increase in the average future water availability for the low climate change projection when compared with the post-1975 historical climate reference period, but significant declines under medium and high climate change projections (**Table 11.2**).

For additional information on climate change projections for all basins in the Central sub-region, please refer to the **Further information** section at

33 Future water availability projections were made using RCP8.5 (see **Appendix D**), in accordance with the Guidelines for Assessing the Impact of Climate Change on Water Availability in Victoria (DELWP, 2020a).

the end of this document.

Table 11.2: Total water availability in river basins under future climate change scenarios (RCP8.534) to the year 2065

Basin	Post-1975 reference point (GL/year)	Post-1997 reference point (GL/year)	Low climate change projection (GL/year)	Medium climate change projection (GL/year)	High climate change projection (GL/year)
Bunyip	357	317	363	289	189
Yarra	871	721	878	728	485
Maribyrnong	81	49	85	64	36
Werribee	76	45	82	62	42

11.4 Cities and towns

Without a planned approach to sustainable water management, Melbourne could face water supply shortfalls this decade. Melbourne and the surrounding region are already reliant on water from the Victorian Desalination Project, to give communities and businesses the water they need and thus avoid severe water restrictions (see **Section 2.7**).

Cities and towns across the Central sub-region need certainty on how to manage future water demands. This is an important role of the proposed Water Supply Readiness Roadmap (see **Chapter 6**). The Roadmap will build on, update and adapt the current planning approach, in order to expand water supplies and return water to the environment and Traditional Owners. This includes investigating new manufactured sources of water, such as additional desalination for the Melbourne supply system and a range of long-term options to re-use more recycled water and increase stormwater harvesting.

The Greater Melbourne Urban Water and System Strategy is being developed by the five water corporations that operate across Melbourne, in parallel with this draft Strategy. It will identify options for securing Greater Melbourne's urban water supplies for the next 50 years, including specific actions for the next five years. It will be an opportunity for the community to consider and comment on proposals at the local and regional scales, and indicate their preferences for specific options and levels of service. Options identified in the Greater Melbourne Urban Water and System Strategy will inform the development of the Roadmap for the final version of this Strategy.

Water efficiency efforts in the Central sub-region will need to continue (see **Chapter 5**).

A focus on Integrated water management

As our cities and towns grow, the volume of stormwater and wastewater produced also increases. Harnessing these water sources helps to save drinking water supplies and meet our water needs in a warming and drying climate. **Section 7.12** proposes a new way to use integrated water management (IWM) in the planning and development of our cities and towns. For the Central sub-region, this needs to be accelerated and acted on now. The pace and scale of urban growth mean that we must think across water sources and across scales, so that our future suburbs, precincts, cities and towns are climate-resilient, liveable places. This is needed at all scales, from lot or development scale (see the box below about Sunbury integrated water management) through to catchment scale (see **Chapter 7**).

To this end, catchment-scale IWM plans are being developed for the Central sub-region. These plans can be used to inform future water- and land-use decisions, including where and how infrastructure is built for communities, commercial precincts and urban renewal areas, and how it works to enhance our natural environments and cultural values of urban waterways. Outcome-based performance targets are needed to drive action across seven strategic outcomes for IWM (see **Figure 11.5**), and include water supply, risk management and place-based planning. These targets will underpin Victoria's water objectives by supporting the use of all water sources across a range of public, private and commercial settings. Opportunities to embed these targets in the relevant regulatory instruments, such as Statements of Obligation or through Council and Community Plans, are currently being explored.

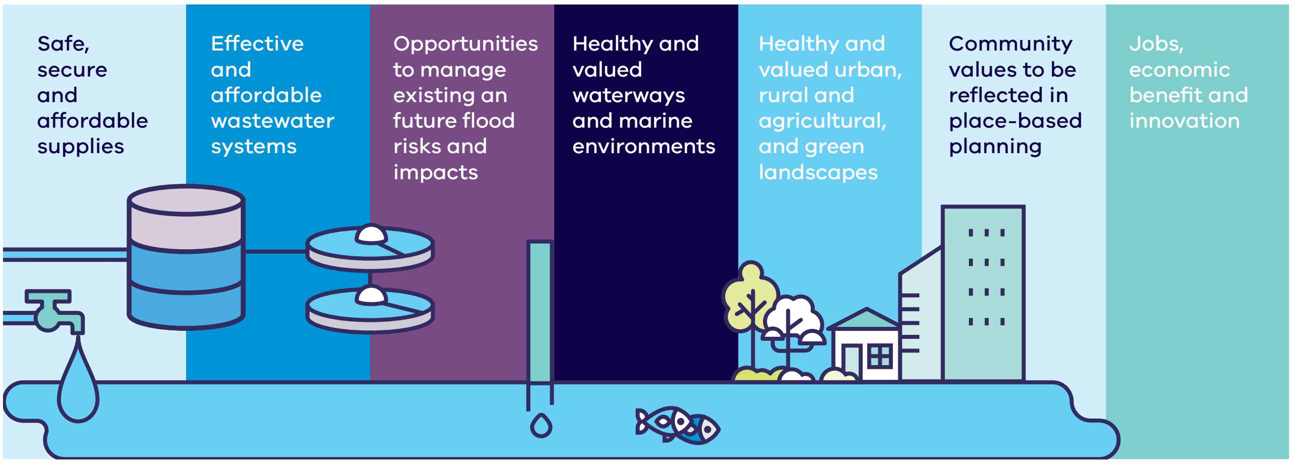


Figure 11.5: The seven strategic outcomes for integrated water management

Image: Melton recycled water treatment plant

Targets will cover themes including:

- gigalitres per year of alternative water sources to substitute for potable mains water supply — recognising the potential of alternative water in helping to meet Melbourne's anticipated supply shortfall due to climate change and population growth
- gigalitres per year of alternative water for agricultural production — to support existing and new production, thereby maintaining the current proportion of Melbourne's food supply provided by local sources in the face of climate change and population growth
- gigalitres per year of recycled water delivered to customers — working to achieve ambitious aspirations to maximise beneficial use of recycled water.

Proposed direction 11-1:

- **The Victorian Government, through the Metropolitan Melbourne Integrated Water Management Forum, proposes to include specific performance targets in the catchment-scale IWM plans for the Central sub-region.**

Water corporations and their delivery partners are actively exploring IWM solutions for new precincts and growth corridors. Local-scale opportunities to supply recycled water and stormwater for irrigating crops and public open spaces are also being evaluated. Continuing this work will help reduce demands on drinking water supplies and maximise the use of local sources of stormwater and recycled water. Putting targets into the right regulatory instruments will enable strategic investment in integrated water management.

Image: Yarra River, South Yarra, Wurundjeri Woi-wurrung Country

Integrated water management for Sunbury

The population of Sunbury is forecast to more than double over the next 20 years. With serious water shortfalls expected in the local area's supplies, this is predicted to lead to an increased reliance on the Melbourne system to supply Sunbury customers. Under current stormwater management arrangements, this will diminish waterway values. Sunbury's Jacksons and Emu creeks will see a decline in populations of platypus, frogs, macroinvertebrates and vegetation, and a weakening of community connection.

Greater Western Water (formerly City West Water and Western Water), Melbourne Water, Hume City Council and the Department of Environment, Land, Water and Planning are working together and with the community to find IWM solutions that bring the greatest benefits to Sunbury's community and environment. Together they developed an initial IWM plan for Sunbury in 2015. It identified and assessed a broad range of water-cycle servicing options against agreed financial, social and environmental criteria. The main objectives were protection and improvement of local waterways, creation of alternative water supplies for local use, and improving the area's liveability.

Of the various options evaluated, a regional-scale stormwater harvesting system for treatment and potable supply was identified as the most attractive and least costly way of achieving these objectives. The project will intercept and harvest stormwater and create the capacity to store and treat it to a potable standard for local use.

A comprehensive community consultation process began in 2018, including an online survey, targeted discussions, community workshops, a deliberative community panel and ongoing engagement with this panel through 2020. The efforts to date are a first for integrated water management in Victoria.

For further information on the process, and to read the panel's report, go to Melbourne Water's Your Say webpage: **https://YourSay yoursay.melbournewater**.

While the independently facilitated community panel was an important step towards genuine community and stakeholder involvement, Melbourne Water and partner organisations will open up discussions with a broader cross-section of the community as soon as possible. At the same time, they continue to explore and progress water servicing solutions identified in the Sunbury IWM plan guided by the community engagement to date.

Pakenham–Cora Lynn Recycled Water Scheme

Large growth forecast for Melbourne's outer reaches will place increasing pressure on drinking water supplies and create higher volumes of wastewater that need to be treated. This presents both a challenge and an opportunity for our communities and the environment. In the Casey Cardinia growth corridor, South East Water, Southern Rural Water, Cardinia Shire Council and the Victorian Government believe that managing future wastewater flows offers an opportunity to benefit the environment and support the region's economic prosperity by improving water security.

The proposed scheme involves diverting sewage from urban areas that would otherwise flow west for treatment and have no productive use to the Pakenham Recycled Water Plant for treatment. The treated water will be available for local urban and agricultural use, the latter by irrigators currently relying on groundwater and the Bunyip River.

Offering a reliable alternative supply of water will build the resilience of primary industries, respond to concerns regarding sustainable use of groundwater and play a role in restoring degraded local waterways. The water will also supplement non-drinking urban water as demand grows, providing an alternative source for greening and liveability, and making our city more resilient by diversifying water resources and delaying the need for costly investment in future supplies. The productive use of recycled water also helps protect the environment from harmful disposal of wastewater as the population grows in south-eastern Melbourne.

The proposed scheme also presents an opportunity to expand productivity in the area east and south of Pakenham, where Cora Lynn, Catani and Lang Lang have potential irrigation areas with good soils and other market conditions suitable for primary industry. Large-scale expansion of the region's horticultural industry is currently limited by surface and groundwater availability, which is increasingly threatened by climate change.

South East Water will expand the recycled water supply to Pakenham South by up to 1 gigalitre every year. The Australian Government will support development of the scheme's business case through the National Water Grid Fund, while project partners South East Water and Southern Rural Water are investigating ways to maximise the scheme's potential.

The expanded scheme, which could be delivered in three stages (subject to funding), is illustrated by the arrows in **Figure 11.6**, with progressive volumes of treated water available for productive use as the region grows:

- Stage 1: Pakenham–Cora Lynn, up to 2.8 gigalitres per year — service shown by red arrows
- Stage 2: Pakenham–Bayles, up to 5 gigalitres per year (plus 2.2 gigalitres per year) — service shown by purple arrow
- Stage 3: Pakenham–Lang Lang, up to 12 gigalitres per year — service shown by green arrows.

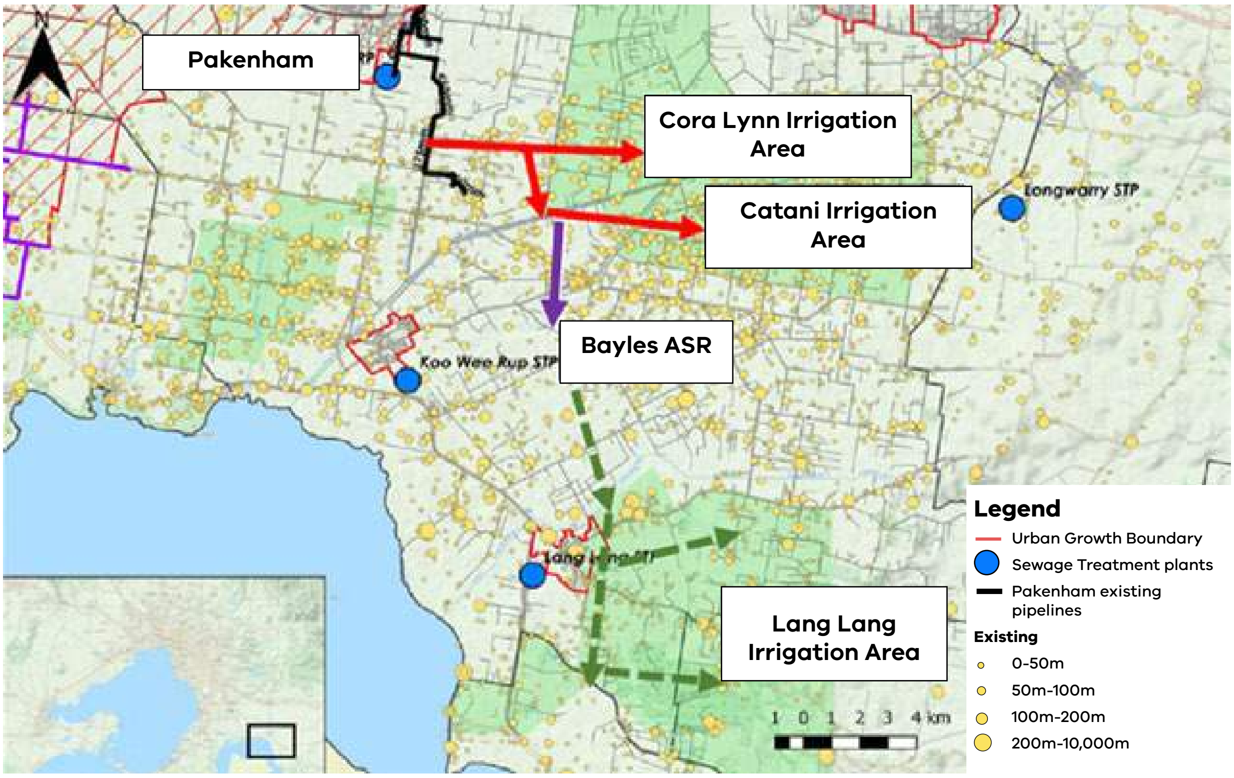


Figure 11.6: Non-potable water plan for south-eastern Melbourne

Image: Pine tree plantation behind a Mirboo rural property, South Gippsland, Bunurong Country

11.5 Reconfiguring the west

Melbourne's west poses both challenges and opportunities for integrated water management, due to its mix of water sources and users.

The Werribee Catchment is the driest in southern Victoria, largely due to a rain shadow caused by the Otway Ranges. Long-term water availability has declined by about 18 gigalitres per year and most of this decline has been borne by the environment, which has an annual environmental water deficit of around 12 gigalitres.

The area is home to the Western Treatment Plant and the significant peri-urban irrigation districts of Bacchus Marsh and Werribee. These districts rely on river water entitlements, supplemented by some recycled water, to supply average annual farm gate demands of about 3.5 gigalitres in the Bacchus Marsh Irrigation District and 12 gigalitres in the Werribee Irrigation District. Only a small amount of local river water is designated for urban supply, and even less for environmental entitlement. Traditional Owners have no entitlements.

The release of water from storages in the upper catchment, including to critical irrigation districts, harms the river's health by increasing the flows during summer months, and storing and reducing flows during the traditionally wetter months.

Drying conditions have resulted in reduced river flows, contributing to higher salinity in the Werribee River, which in turn reduces water reliability and quality in the river's downstream reaches and the irrigation districts. In the Werribee Irrigation District, recycled water supplements the river water, but the recycled water is too saline for optimum crop quality and yield.

The catchment is also experiencing some of the fastest population growth in Australia. This will increase water demand, but at the same time will increase the availability of useful recycled water and stormwater. By 2050, the forecast population growth is projected to add:

- 25 gigalitres per year of drinking water demand
- 25 gigalitres per year of local wastewater inflows, a portion of which will be treated and used for a new irrigation district (Parwan–Balliang Irrigation District) via the Western Irrigation Network
- more than 40 gigalitres per year of stormwater run-off from impervious surfaces in new urban areas.

There is a unique opportunity to rethink water management in the Werribee Catchment — using integrated water management. We need to examine all water demands (irrigation, environment, Traditional Owner and urban) and how all sources of water in the catchment (river water, recycled water and stormwater) can meet these demands over the long term.

The potential to use the large volumes of water produced in the catchment (including stormwater and recycled water) throughout the year depends on identifying uses for the water when it is available, treating the water to a standard required for re-use, and having adequate storage to hold the water for when it is needed. Central to this is understanding the needs of potential end-use customers — for example, by working with local irrigators to understand their current and future needs, in terms of water quantity as well as quality.

In considering opportunities in the west, we should focus on achieving the following:

- a secure future for agriculture in the catchment by ensuring a reliable supply of water, with long-term security and a salinity level suitable for irrigation
- cost-effective urban water supply, for potable and non-potable uses
- healthier waterways, by increasing entitlements for the environment and capturing and re-using stormwater to reduce harm to receiving waterways
- healthier receiving environments — reducing treated wastewater discharge
- greater use of recycled water that generates value from the associated nutrients.

Achieving these goals through an ambitious reconfiguration will require close collaboration with water users in the region and leadership from all organisations involved.

Proposed direction 11-2:

- **The Victorian Government proposes to develop a business case for reconfiguring the Werribee system to provide more climate-resilient water sources for non-drinking purposes, thus making better use of all sources of water and reservoirs in the local system.**

Options being considered include:

- providing fit-for-purpose (including appropriate salinity level) recycled water for the Werribee and Bacchus Marsh irrigation districts, including the opportunity for additional supplies
- harvesting stormwater from the Melton growth area for re-use, thus also protecting local waterways
- supplying recycled water from the Western Irrigation Network's Sunbury-to-Melton pipeline to irrigate open space and schools in the Melton growth area
- using returned river entitlements for environmental water recovery, to provide water justice to Traditional Owners, and for urban supply.

11.6 Water for agriculture

The Victorian Government will protect farms in and around urban fringes so that they continue working and producing for generations to come Some of Victoria's most productive agricultural land is within 100 kilometres of central Melbourne, providing much of the food we eat and thousands of jobs in agriculture, conservation and tourism. As food insecurity increases around the world due to climate change, local agricultural land becomes even more important to Victoria's food supply.

Water use for irrigated agriculture in the Central sub-region is concentrated in the Werribee and Bacchus Marsh irrigation districts and there are new areas emerging through the Western Irrigation Network. Water is diverted from waterways to supply irrigated farms throughout the catchments, while dryland properties use water from farm dams, groundwater and waterways.

The current requirement that agricultural users manage their own water supply risks is unlikely to meet future irrigator needs, due to the decline in availability and quality of river water and groundwater. Opportunities to use recycled stormwater and wastewater produced by urban areas need to be explored, not only to support high-quality agricultural production but also to re-use the by-products of urbanisation.

Image: Tractor in a field in the Werribee Irrigation District, Werribee South, Bunurong Country

While access to secure and fit-for-purpose water is an essential component of irrigated agriculture, using alternative water may not be cost effective for farmers in the short to medium term. Opportunities for using recycled and stormwater for agriculture are often site-specific, local or decentralised. Long-term planning should consider ways in which access to all sources of water can help sustain irrigated agricultural production into the future and support expansion of peri-urban agriculture for greater food security and economic productivity. This includes strategic consideration of future urban developments and wastewater treatment infrastructure.

Opportunities may involve the Western Treatment Plant (see the box below about the Werribee reconfiguration) or smaller scale treatment plants located across the sub-region (see the example of the Pakenham–Cora Lynn Recycled Water Scheme).

Proposed direction 11-3:

- **The Victorian Government proposes to quantify current and future agricultural demand for water in Melbourne's green wedges and peri-urban areas, and provide information on potential sources of water, including stormwater and recycled water.**

Opportunities may include:

- establishing irrigation networks similar to the Western Irrigation Network, in the northern Maribyrnong catchment or adjacent catchment areas
- supplying recycled water from the Western Irrigation Network Sunbury-to-Melton pipeline to irrigate open space and schools in the Melton growth area
- expanding the Western Irrigation Network to use more recycled water from other Greater Western Water water recycling plants, which would otherwise be discharged to waterways
- supplying recycled water to agriculture and open space in the Sunbury–Bulla–Keilor areas, including the Keilor Irrigation District
- using recycled water from the Pakenham Water Recycling Plant for agriculture in the Pakenham–Cora Lynn area, and further expanding use of recycled water from the Pakenham Plant network, for agriculture to the south and east beyond Pakenham–Cora Lynn
- using recycled water for irrigated agriculture in the Tyabb–Somerville area, and further expanding the agricultural use of recycled water from the Eastern Treatment Plant
- supplying recycled water to the Kingston green wedge and beyond, expanding use of recycled water from the Eastern Treatment Plant for a range of purposes including tourism, agriculture, industry, sports fields, passive open space and major activity hubs.

The Victorian Government has been investing in rural water infrastructure projects that support resilient and productive regional communities. In recent years, co-investment by the Victorian Government, rural water customers and the Australian Government has supported rural water projects, including modernisation of the Werribee and Bacchus Marsh irrigation districts. Phase 3 of this modernisation project will allow between 2 and 2.3 gigalitres per year to be returned to the Werribee River (the precise volume to be confirmed in 2022).

The Victorian Government and Southern Rural Water have secured funding from the Australian Government to complete the modernisation of the Werribee Irrigation District. Stages 4 and 5 are estimated to secure additional water savings of approximately 1.3 gigalitres per year, at a capital cost of $20.9 million.

The final works to complete the modernisation of the Bacchus Marsh Irrigation District (Stage 5) are focused on road access and improvements to liveability of the local area, including decommissioning about 6 kilometres of channels and constructing a short (less than 1 kilometre) section of pipe. Southern Rural Water is working with councils and other bodies to identify ways to fund the approximately $3 million required to complete these decommissioning activities and build recreational infrastructure such as bike paths.

The previous Central Region Sustainable Water Strategy recommended purchasing water entitlements from farmers through voluntary buy-back. The Victorian Government does not currently support untargeted purchases of water entitlements from farming, due to the socio-economic impacts caused by such programs in the past, particularly in northern Victoria.

Water substitution on the Werribee and Lerderderg rivers

The Victorian Government is exploring opportunities to use treated, high-quality, fit-for-purpose recycled water to secure the long-term supply of water for irrigation in the Werribee and Bacchus Marsh irrigation districts. The Werribee Irrigation District covers more than 3,000 hectares of intensive, high-value horticulture, including green leafy vegetables, and generates more than $187 million per year in farm gate value. Bacchus Marsh Irrigation District covers around 900 hectares and generates more than $50 million in farm gate value.

Providing high-quality, reliable and plentiful recycled water to irrigators could enable the use of existing water sources for other purposes, including for Traditional Owner use.

Supporting rural landowners to improve waterway health in the Central sub-region

Melbourne Water's Rural Land Program, soon to be incorporated into Melbourne Water's new Liveable Communities Liveable Waterways incentives program, advocates for best management practices that reduce nutrient and sediment run-off from rural properties from entering waterways that flow into Port Phillip and Westernport Bays. Specific activities funded under the incentives program include farm planning and design, gully exclusion and revegetation, track and drainage improvements, stormwater harvesting and reuse, erosion control and sediment ponds, pasture improvement, effluent management, soil analysis and nutrient budgeting, off-stream/dam stock watering and dam decommissioning.

In the Yarra Catchment, where Melbourne Water is the Diversion Manager, through the incentives program rural land officers have the opportunity to engage landholders and assist with the development of irrigation and drainage plans to improve run-off quality and meet targets under the Healthy Waterways Strategy performance objectives.

A number of events have been supported by the program such as farm property planning, nutrient management planning for dairy farmers and development of pest animal and plant management plans. Under the 2018 Melbourne Water Healthy Waterways Strategy, rural land priority areas have expanded, allowing for additional areas to be engaged and recruited under the program.

Further information: **www.melbournewater.com.au/liveable-communities-liveable-waterways.**

11.7 Water justice for Traditional Owners

Traditional Owners have a responsibility to care for Country, including lands and waters. When Country is healthy and cared for, it supports healthy people and healthy economies, which in turn benefit everyone in the region. Traditional Owners with Registered Aboriginal Party status in the Central sub-region include the Bunurong Land Council Aboriginal Corporation, Wurundjeri Woi-wurrung Cultural Heritage Aboriginal Corporation and Wadawurrung Traditional Owners Aboriginal Corporation. These three groups do not currently hold any water entitlements. See **Section 4.2** for more details from the Traditional Owners of the Central sub-region about their contributions to the development of this Strategy so far and their aspirations for water.

This Strategy will play a significant role in returning water to Traditional Owners, as well as strengthening and developing agreement-making between Traditional Owner groups, water corporations and government agencies. The majority of opportunities to return river water to Traditional Owners in the Central sub-region will be realised via substitution arrangements as new manufactured sources of water (desalination and recycled water) are added to the system for urban or agricultural use (see **Section 8.1**).

In the Central sub-region, the Victorian Government proposes to return water to the Wurundjeri Woi-wurrung Cultural Heritage Aboriginal Corporation from rivers within its Registered Aboriginal Party boundary,[34] including:

- allocating a 1.4-gigalitre water licence in the Yarra River, equivalent to the 1.4 gigalitres previously used by the Amcor Paper Mills and now held by the Department of Environment, Land, Water and Planning
- evaluating opportunities and ways to give water to Traditional Owners, including working with the City of Melbourne and the Royal Botanic Gardens to review the water entitlements given to them by Amcor for public use
- freeing up water in the Werribee Catchment as new manufactured sources are created to meet existing demands
- freeing up water in the Yarra River as new manufactured sources are created for Melbourne
- freeing up water in the Maribyrnong River as new manufactured sources are created for urban customers supplied by Greater Western Water.

In the Central sub-region, the Victorian Government proposes to return water to the Wadawurrung Traditional Owners Aboriginal Corporation from rivers within its Registered Aboriginal Party boundary, including freeing up water in the Werribee River as new manufactured sources are created to meet existing demands

In the Central sub-region, the Victorian Government proposes to identify opportunities to return water to the Bunurong Land Council Aboriginal Corporation from rivers within its Registered Aboriginal Party boundary,[35] including freeing up water from the Bunyip River and other smaller river systems as other new sources are found to meet existing demands.

11.8 Water for the environment

Communities in the Central sub-region rely heavily on rivers to provide water for drinking and other everyday needs. These same rivers are those that we walk or ride along, paddle on, and visit for their natural features. To support these social and recreational values, rivers need water too. But their flows are declining due to climate change, and will decline further, affecting all values and uses.

Water recovery, or reduction in the extraction of water from our rivers for consumptive use, will maintain or improve the environmental values of these rivers and provide benefits for Traditional Owner cultural values, as well as broader economic and social values.

For the many smaller urban waterways in the region, such as Kororoit Creek, Dandenong Creek and Diamond Creek, the main threat is too much stormwater runoff from their highly urbanised and developing catchments. The water management focus must be to reduce the amount of stormwater, and its associated pollution, entering the waterways to improve waterway health and water quality. There are several proposed directions in Chapter 7 to improve stormwater management, including

34 Draft actions for the Strategy were based on Registered Aboriginal Party (RAP) boundaries as at 30 June 2021. There may be revisions to the actions in the final Strategy that reflect changes to the RAP boundaries from 1 July 2021.

35 Draft actions for the Strategy were based on Registered Aboriginal Party (RAP) boundaries as at 30 June 2021. There may be revisions to the actions in the final Strategy that reflect changes to the RAP boundaries from 1 July 2021.

proposals to embed integrated water management in land-use planning and management as described in Section 7.12. The health and recreational values of the many urban waterways across Metropolitan Melbourne and their lands are essential to the liveability and community health of local neighbourhoods and the broader environment.

Melbourne's west is rapidly transforming, through significant population growth and urban development. The warming and drying climate is already affecting the waterways, and this combined with the population growth is putting significant pressure on local rivers and creeks which are important natural spaces for their environmental, health and wellbeing values. The Waterways of the West Ministerial Advisory Committee (including the region's Wurundjeri Woi-wurrung and Wadawurrung Traditional Owners) listened to community views and aspirations and provided recommendations to Government in 2020 on how to protect these waterways, such as the Moonee Ponds Creek, Stony Creek and Skeleton Creek. Key directions identified for action by the MAC included the need to address water for culture and environment, along with the need to address waterway pollution and threats from stormwater. These recommendations, along with the Waterways of the West Community Vision have informed the upcoming Waterways of the West Action Plan. The action plan will articulate government's specific commitments to protect and enhance the Waterways of the West for future generations.

The remainder of the section outline a range of water recovery targets and complementary works for each of the major waterways in the Central sub-region.

Werribee River

We need to recover an additional 11,885 megalitres of water to improve water quality for native fish, frogs and platypus, prevent blue-green algal blooms, allow populations of native freshwater fish species (including galaxiids) to survive and thrive, and provide refuges for fish.

Proposed direction 11-4: Werribee River

- **The Victorian Government proposes an additional environmental entitlement of up to 11,885 megalitres per year for the Werribee River within 10 years, to improve waterway health by maintaining water quality and providing refuges for fish.**

This could be achieved through a combination of:

- water savings through irrigation modernisation
- increasing use of stormwater and/or recycled water to reduce non-drinking demands for river water
- allocating a share of river water to the environment each time a new water source for consumptive users is brought online.

Image: Werribee River at the K Road Cliffs, border of Bunurong Country and Wadawurrung Country

Table 11.3: Proposed targets and options for environmental water recovery in the Werribee River

Benefit	Water recovery target (ML/yr)	Timeframe
• Maintain water quality and prevent blue-green algal blooms • Provide refuges for fish • Protect and increase populations of native freshwater fish species including galaxiids	9,607	5 to 10 years
• Flush pools and prevent blue-green algal blooms • Protect and increase populations of black bream in the estuary • Maintain the platypus population • Improve water quality and maintain access to habitat for native fish, frogs and platypus • Provide enough flow for native fish to move between habitats	11,885	Up to 10 years
• Secure the long-term protection of priority environmental values	12,183	50 years

Social and recreational values along the lower Werribee River

Melbourne's West has a significant need for additional green space and recreational opportunities that are high quality and widely accessible, due to a fast-growing population, dry climate and limited open space.

Planning along the lower Werribee River is setting a holistic vision for a lower Werribee River experience. A recreation plan has identified priorities for additional recreational infrastructure, such as shared path connections and multi-use platforms, to enable locals and visitors alike to connect with nature in this riverine environment.

The plan can be viewed on the Melbourne Water Your Say webpage: **https://yoursay.melbournewater.com.au/lower-werribee-river**.

This planning process will ensure that the benefits from environmental water recovery are shared and enjoyed by the entire community.

Investigations are required to determine fish passage requirements for the lower Werribee diversion weir and improve the effectiveness of environmental watering. Melbourne Water, Southern Rural Water and Traditional Owners will work together to find the best solution. In addition to the removal of fish barriers, there is also a requirement for more habitat for fish and other aquatic fauna through the introduction of snags in the lower Werribee River. Melbourne Water and Traditional Owners will work together on this.

Proposed direction 11-5: Werribee River

- **The Victorian Government proposes to improve the health of the Werribee River.**

This could be achieved through a combination of:

- investigating fish passage requirements for the lower Werribee diversion weir
- improving habitat for native fish by reintroducing snags and logs in the waterway.

Maribyrnong River

An additional 3,000 megalitres of water recovery is needed within five years to provide enough water to flush pools and maintain water quality during summer, allow populations of native freshwater fish species (including galaxiids) to breed and move between habitats, and to provide aquatic habitat for platypus and waterbugs (**Table 11.4**).

Proposed direction 11-6: Maribyrnong River

- **The Victorian Government proposes to recover up to 3,000 megalitres of water for the Maribyrnong River within five years, to support environmental and Traditional Owner cultural values, and broader economic and social values.**

Proposed direction 11-7: Maribyrnong River

- **The Victorian Government proposes to recover up to 4,000 megalitres of additional water for the Maribyrnong River within 10 years, to support environmental and Traditional Owner cultural values, and broader economic and social values.**

This could be achieved through a combination of:

- investigating options for permanent trading of unused diversion licences to improve waterway health
- investigating options to transfer unused parts of consumptive entitlements to the environment
- returning a share of river water to the environment each time a new major water source for urban use is brought online
- investigating options to increase use of stormwater and/or recycled water to reduce non-drinking demands for river water (to contribute to the 10-year targets).

Table 11.4: Proposed targets and options for environmental water recovery in the Maribyrnong River

Benefit	Water recovery target (ML/yr) cumulative	Timeframe
• Flush pools to maintain water quality • Protect and increase populations of native freshwater fish species, including galaxiids • Provide for movements between habitats for small-bodied native fish, including ornate galaxias • Maintain native frog and platypus populations	3,000	Up to 5 years
• Maintain pool habitats for small-bodied fish and refuges during dry periods • Maintain self-sustaining populations of small-bodied fish • Provide best ecological and cultural outcomes for the river system	7,000	Up to 10 years

The current outlet capacity at Rosslynne Reservoir on the Maribyrnong River is only 22 megalitres per day (20 megalitres per day if reservoir levels are low), which limits the volume of water that can be released. High flows of 40 megalitres per day cannot be released, due to outlet constraints, thus limiting the potential effectiveness of a future environmental entitlement. Melbourne Water, Southern Rural Water and Traditional Owners will work together to find the best solution to this problem, and to seek opportunities to remove fish barriers from the Maribyrnong to improve fish movement through the system.

Proposed direction 11-8: Maribyrnong River

- **The Victorian Government proposes to improve the health of the Maribyrnong River.**

This could be achieved through a combination of:

- upgrading storage at Rosslynne Reservoir to improve the capacity of infrastructure to supply freshes and winter high flows
- removing willows and other weeds from the upper catchment and establishing vegetation buffers to improve water quality
- removing weirs from the upper Maribyrnong.

Yarra River

An additional 11,000 megalitres of water recovery is needed within 10 years to enable populations of native freshwater fish species (including Australian grayling) to survive, and to allow platypus to move between habitats (**Table 11.5**).

Proposed direction 11-9: Yarra River

- **The Victorian Government proposes to recover up to 11,000 megalitres of water for the Yarra River within 10 years, to support environmental and Traditional Owner cultural values, and broader economic and social values.**

This could be achieved through a combination of:

- increasing use of stormwater and/or recycled water to reduce non-drinking demands for river water
- returning a share of river water to the environment each time a major new water source for urban use is brought online.

Table 11.5: Proposed targets and options for environmental water recovery in the Yarra River

Benefit	Water recovery target (ML/yr) cumulative	Timeframe
• Prevent loss of Australian grayling (threatened species). • Provide opportunities for platypus to move along the river • Maintain fish populations (including tupong, Macquarie perch, galaxias and eels)	11,000	Up to 10 years
• Secure the long-term protection of priority environmental values	34,000	50 years

Bolin Bolin: collaborating to protect an iconic billabong

Melbourne Water is collaborating with the Victorian Environmental Water Holder, Parks Victoria and the Wurundjeri Woi-wurrung Cultural Heritage Aboriginal Corporation to determine the water requirements for the Bolin Bolin Billabong. A long-term solution is sought to protect the billabong's ecological values and the Traditional Owners' strong cultural connections.

Passing flow review

Passing flows have declined at several locations across the Central sub-region, due predominantly to a drier climate and declining inflows at reservoirs and diversion weirs. The rules governing passing flows in Victoria were typically designed more than two decades ago, and many do not contemplate maintaining passing flows under a drying climate. At some locations it may be possible to amend the passing flow rules to benefit the environment, Traditional Owners, stock and domestic users and recreational users, without disadvantaging existing users.

Proposed direction 11-10:

- **The Victorian Government proposes a review of passing flows in the Werribee River (at the lower Werribee diversion weir), Maribyrnong River (at Jacksons Creek below Rosslynne Reservoir) and Yarra River (at Upper Yarra Reservoir) to identify opportunities to improve minimum flows and provide shared benefits to Traditional Owners, the environment, stock and domestic users and recreational users, without reducing the reliability of existing entitlements.**

Pollutant load targets

Excessive nutrients and sediments can cause threats to marine and estuarine water environments. Pollutant load reduction targets for Port Phillip Bay, Western Port and the Western Treatment Plant, as specified in the State Environment Protection Policy (Waters), guide investment to ensure the protection of water quality and beneficial uses. From 1 July 2021, the Environment Reference Standard will replace the State Environment Protection Policy (Waters) and will set out the environmental values to be achieved or maintained in Victoria (including for water). It includes these same pollutant load reduction targets.

This draft Strategy provides an opportunity to confirm the existing pollutant load reduction targets as a means of dealing with the major threats to water quality in the region. It also commits to Traditional Owners self-determining priorities for objectives and indicators that are to be developed to protect Traditional Owner cultural values recognised in the Environment Reference Standard (see **Chapters 4** and **7**).

To maintain nutrient and sediment inputs at levels that will achieve the target in response to population growth and land-use change, we need to ensure that:

- seasonal loads of total nitrogen do not decrease the denitrification efficiency of Port Phillip Bay or increase the risk of nuisance algal blooms
- there is no net increase in the total annual load of nitrogen discharging from sewage treatment plants (both existing and proposed) directly into Port Phillip Bay, or into waterways in the Port Phillip Bay catchment
- the contribution of total nitrogen load and total suspended solids load from the Yarra and Maribyrnong rivers does not exceed 70 per cent of total annual average load from all surrounding waterways discharging into Port Phillip Bay.

Proposed direction 11-11:

- The Victorian Government proposes to implement plans and undertake management actions to meet the pollutant load reduction targets specified in the Environment Reference Standard for Port Phillip Bay, Western Port and Western Treatment Plant by 2027.

Table 11.6: Pollutant load targets for Port Phillip Bay, Western Port and Western Treatment Plant#

Source	Annual pollutant load total nitrogen (tonnes)	Years in which target to be achieved annually
	Nitrogen	
Surrounding waterways (to Port Phillip Bay)	1,500–2,200	2017–2027
Western Treatment Plant (to Port Phillip Bay)	3,100 (based on rolling 3-year average)	2017–2027
	Total suspended solids	
Surrounding waterways (to Port Phillip Bay)	60,000–70,000	2017–2027
Catchment and coast (to Western Port)	28,000*	2018–2028

Pollutant load targets for waterways are expressed as a minimum and maximum range of nutrients in tonnes per year.

* There must be a 15 per cent decrease in total suspended sediment concentration in the East Arm segment, from an annual mean of 40 milligrams per litre to an annual mean of 34 milligrams per litre by 2028.

Image: Industrial estate behind Cherry Lake, Altona, Bunurong Country

12. The Barwon, Moorabool and Otways sub-region

Image: Buckleys falls, Highton, Geelong, Wadawurrung Country

12.1 The sub-region

The Barwon, Moorabool and Otways sub-region includes the major urban centres of Ballarat and Geelong, as well as many smaller towns. Around half of the Otway Coast Basin retains native vegetation cover, mainly on the forested slopes of the Otway Ranges. Most of the Barwon and Moorabool basins have been cleared for grazing, with patches of remnant native vegetation, much of which is in the Leigh River Gorge.

Barwon Water supplies water to customers across a large part of the sub-region: from Little River and the Bellarine Peninsula in the east, from Meredith and Cressy in the north, to Apollo Bay on the south-western coast and Colac in the west. Ballarat is supplied by Central Highlands Water. Wannon Water uses water from the Gellibrand River in the Otways to supply Warrnambool.

The Barwon River and rivers of the Otway Coast area are significant to Traditional Owners, the Wadawurrung people and the Eastern Maar people. The Moorabool River is significant to the Wadawurrung people; there are many significant sites located along the river and its tributaries.

Communities also value the waterways of the sub-region for fishing, boating and waterside recreation.

Basin

Park or reserve

Water body

TRADITIONAL OWNERS: The Wadawurrung and Eastern Maar are Registered Aboriginal Parties. This Sustainable Water Strategy will support cultural, economic, and spiritual self-determination opportunities for Traditional Owners.

ENVIRONMENT: Communities value the waterways of the sub-region for fishing, boating and waterside recreation.

RECREATION/SOCIAL: Significantly urban shortfall of 450 GL across the sub region estimated under a high climate change and high population growth scenario by 2065. Close to annual demand outstripping supply sources already.

URBAN: Cities and towns (including Geelong and Ballarat) will need a lot more water in the future. We are facing urban water shortages as population grows and less water is available given climate change.

WATER FOR AGRICULTURE: Agriculture in the sub-region is predominantly dairying and cattle grazing. There are numerous other domestic and stock water users. All are facing reduced water availability due to climate change.

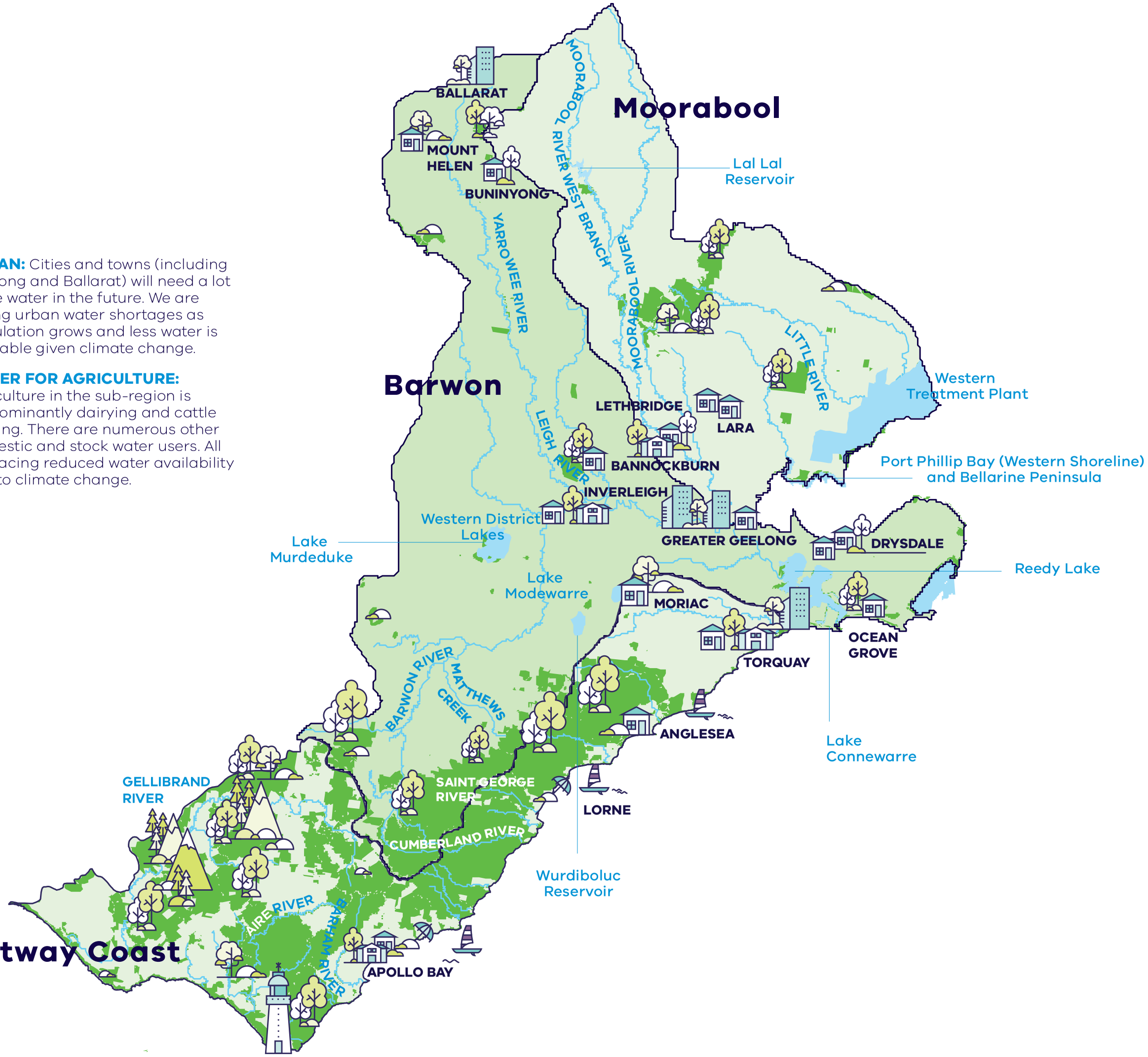


Figure 12.1: The Barwon, Moorabool and Otways sub-region: basins, major water uses and some of the opportunities and challenges ahead

12.2 The challenge

The Barwon and Moorabool sub-region is facing significant challenges: a drying climate, flow-stressed rivers, historical exclusion of Traditional Owners from water rights, and projected urban shortfalls in the current decade. The proposals for this sub-region need to help secure water for households, businesses, farmers and Traditional Owners, and return water to local rivers.

For Traditional Owners, the rivers of this sub-region are connected to Dreaming stories and have intangible cultural values, as well as physical cultural heritage sites that are threatened and need to be protected for current and future generations. Water justice is sought through the return of water to Traditional Owners and water to support Traditional Owner cultural values.

The cities of Greater Geelong and Ballarat are projected to see Victoria's greatest regional population growth over the next 15 years. Geelong is already facing near-term urban water shortfalls that cannot necessarily be met by local sources; a move to climate-resilient sources is likely to be needed by the end of this decade. At the same time, increases in stormwater and recycled water will result from increasing urbanisation; these will potentially damage waterway health if not managed appropriately.

Communities want a secure water future, but one that does not threaten waterway health. There is a strong desire to reduce reliance on water extracted from rivers and groundwater and use a more diverse mix of water sources.

Water for the environment in the Barwon and Moorabool rivers is currently not sufficient to protect even critical habitat and species, with subsequent impacts such as regular fish death events and algal blooms.

Economic opportunities also rely on the environmental condition of the Barwon River, especially in Geelong. The increasing shift in population to regional centres and focus on nature-based tourism all demonstrate the importance of securing future water supplies and waterway health in the sub-region.

12.3 Water resources and uses

The Moorabool River begins between Ballarat and Ballan in the Central Highlands in the northern part of the sub-region; it joins the Barwon River at Queens Park in Geelong. The Barwon River rises in the Otway Ranges and flows through Inverleigh to Geelong and out to Barwon Heads. The Yarrowee and Leigh rivers begin north of Ballarat and flow through urban Ballarat before joining the Barwon River at Inverleigh. The Barwon River also has significant wetlands, such as Reedy Lake and the Lake Connewarre wetlands complex, which form part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site. The Otway Coast Basin encompasses the numerous small creeks and rivers that flow to the coast from the Otway Ranges between Torquay and Peterborough, including the Gellibrand, Barham and Cumberland rivers.

Water use in the sub-region is predominantly for cities and towns (**Table 12.1**). Lal Lal Reservoir, located on the Moorabool River, holds water for Central Highlands Water, Barwon Water and the Victorian Environmental Water Holder. Other storages managed by Barwon Water include West Barwon Reservoir and Wurdee Boluc Reservoir. Water is also taken for irrigation or other rural uses by diverters who hold take-and-use licences, and by licensed farm dams. There are some small volumes of unallocated surface water in the Otway area, including in the Gellibrand River, Aire River and other small coastal creeks and rivers.[36] These volumes of unallocated surface water cannot be used to meet the growing needs of Geelong or other towns in the sub-region — they are too small and not in suitable locations, meaning they are not a cost-effective source of urban supply, and the community does not support the use of new surface water supplies to meet growing demands.[37] The proposed approach for allocating this water is set out in **Section 8.4**.

Although on an annual average basis only a small proportion of a river's total water might be extracted in a given year (**Table 12.1**), the proportion extracted during the dry months can significantly affect the river.

The sub-region includes the western side of West

36 Unallocated water is water that can be issued within the sustainable limit for extraction, or cap, from a given resource.

37 Barwon Water did not propose taking any further water from the Gellibrand River in its 2017 Urban Water Strategy and will not include it as an option in their 2022 Urban Water Strategy.

Port Phillip Bay groundwater catchment, the Hopkins–Corangamite catchment, and the Otway–Torquay groundwater catchment.[38]

In the Otway–Torquay groundwater catchment, groundwater from the Anglesea borefield is used for urban water supply when local surface water supplies are low. Barwon Water's entitlement allows it to supply water to homes and businesses in Greater Geelong, Anglesea, Aireys Inlet, Torquay and the Bellarine Peninsula. Licensed groundwater use elsewhere in the sub-region is relatively low.

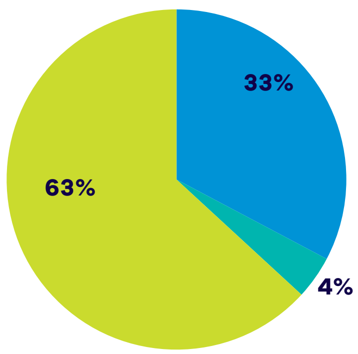
Relatively small volumes of recycled water are generated across the sub-region; the quantities produced are used mainly for irrigating farms, and also on sporting fields, significant gardens and to maintain water levels in Lake Wendouree in Ballarat. The Northern Water Plant in Geelong supplies nearly 2 gigalitres of recycled water each year to the VIVA Energy Geelong Refinery, substituting the drinking water previously used by the refinery for its operations.

For additional information on water resources and uses for all basins in the Barwon-Moorabool and Otways sub-region, please refer to **Further information** at the end of this document.

Table 12.1: River water availability in the Barwon, Moorabool and Otways sub-region, by water user[39]

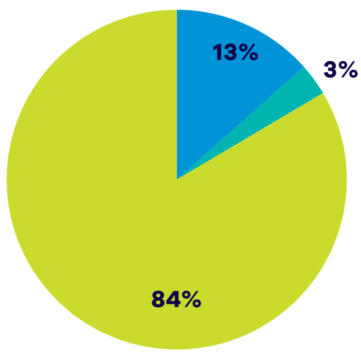
Moorabool Basin: Consumptive water uses include urban water supply to Ballarat and Geelong.

Although urban centres are the largest consumptive users, water is also taken for irrigation and other rural uses by diverters with take-and-use licences, and by licensed farm dams.



Barwon Basin: Consumptive water uses include urban water supply to Geelong, and private diversion of water from streams and waterways for agriculture.

A small volume of water from the Leigh River (which flows into the Barwon River) is supplied to Ballarat for urban water supply.

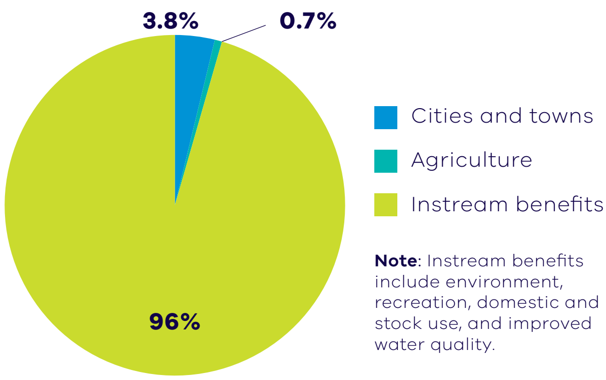


38 The sub-region includes the Bungaree, Cardigan, Colongulac, Gellibrand, Gerangamete, Glenormiston, Newlingrook, Warrion and Paaratte groundwater management areas.

39 Excludes water use under section 8 rights.

Otway Basin: Less than 5 per cent of average annual inflow is allocated to consumptive use. Water in the basin supplies towns in the basin such as Apollo Bay and Lorne, as well as towns outside the basin, including Colac and Warrnambool.

Other uses include private diverted and licensed commercial or irrigation farm dams.



Note: Instream benefits include environment, recreation, domestic and stock use, and improved water quality.

Image: Anglesea River, Anglesea, Wadawurrung Country

Seasonal variability

Water availability and the way water is shared are typically expressed as average annual volumes. However, both the natural flow in rivers and demands for water vary substantially between seasons each year.

For example, the Gellibrand River's flow in winter has been eight times higher than in summer between 2011 and 2015, despite that period including some years with low inflows (**Figure 12.2** and **Figure 12.3**).

To protect low flows, diversions for irrigation must reduce or cease when flow in rivers falls below trigger levels and extractions for urban uses must reduce when particular triggers are met but are not required to cease completely. Winterfill licences restrict take to wetter months of the year. Through the Gellibrand Summer Flows Improvement Project, government and the community have identified additional options to reduce summer flow stress in the Gellibrand River.

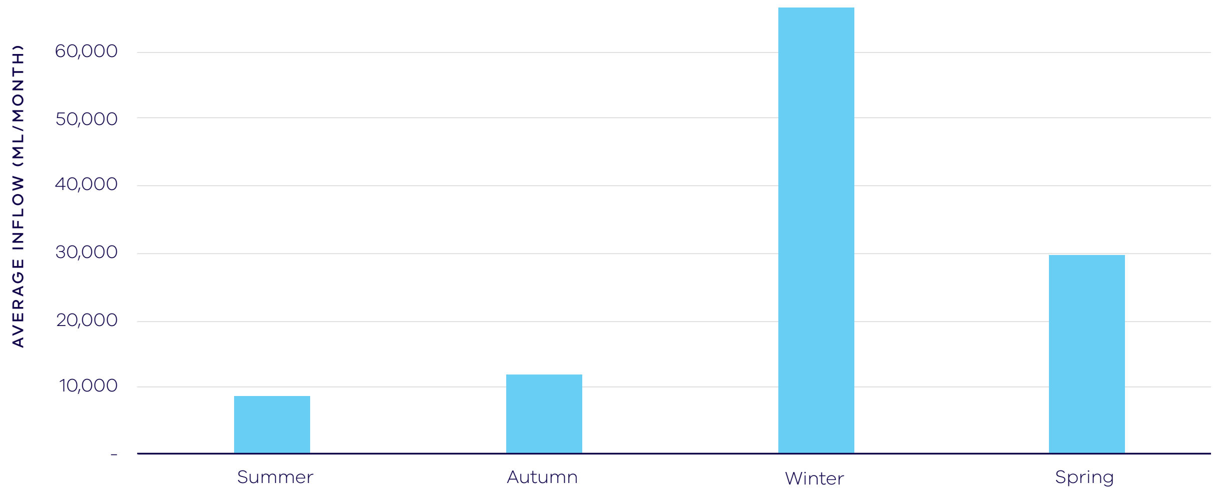


Figure 12.2: Seasonal variation in flow in the Gellibrand River (upstream of Lardners Creek), 2011–15

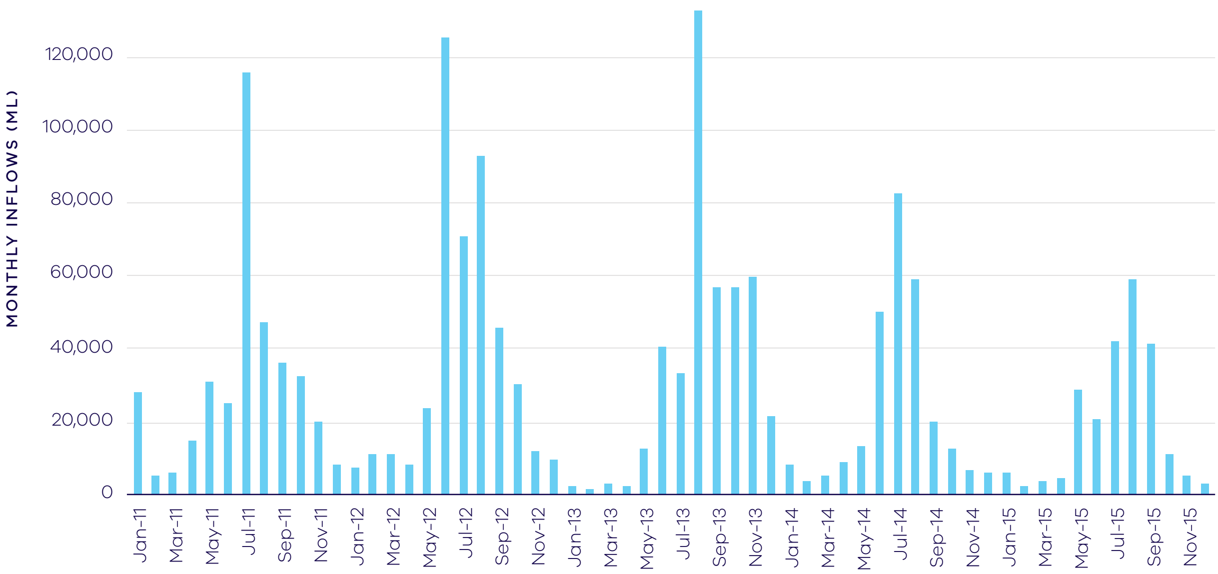


Figure 12.3: Average monthly inflows by season in the Gellibrand River (upstream of Lardners Creek), 2011–15

Image: Eskerine Falls, Eastern Maar Country

Small catchment dams

Farm dams, including those licensed for irrigation and commercial use, and small catchment dams (sometimes referred to as domestic and stock dams), intercept run-off before it reaches a waterway. Small catchment dams can provide an important source of water for landowners to water stock and to supply water for use around the home and garden for non-commercial purposes. However, the cumulative impact of small catchment dams can significantly reduce the availability of water for downstream users.

Aerial photography has been used to estimate the number and location of farm dams across Victoria, so we can say with certainty that there is a high density of dams in the Barwon, Moorabool and Otway Coast regions, particularly in the upper reaches of the Moorabool and Leigh rivers. This includes the catchments that feed Lal Lal Reservoir.

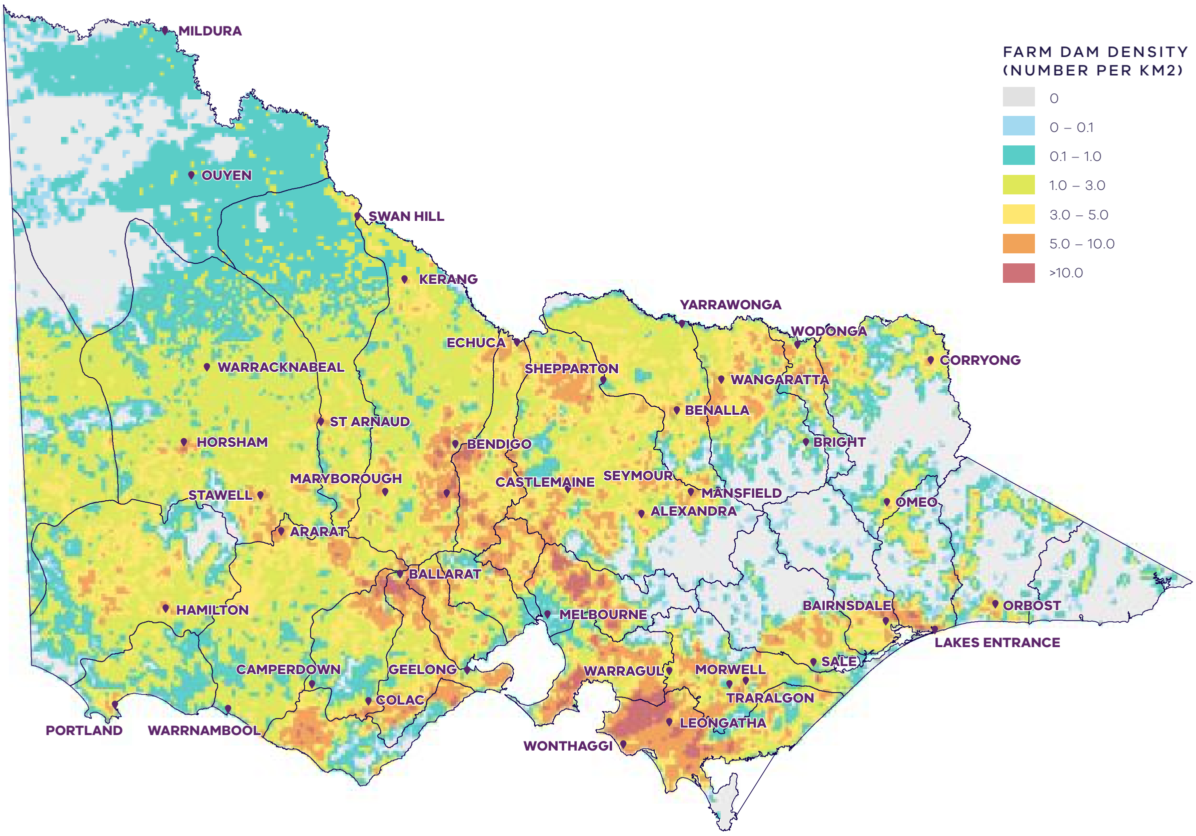


Figure 12.4: Heat map showing the density of farm dams (number of dams per unit area), including both small catchment dams and licensed commercial and irrigation dams

Modelling indicates that small catchment dams have historically intercepted 8% of the annual run-off in the Moorabool Basin, 5% in the Barwon Basin and 2% in the Otway Basin.[40]

The impacts of small catchment dams are likely to increase under a drying climate. The proportion of run-off intercepted by small catchment dams is greatest in dry years because they get the first run-off when rainfall events occur. For example, in the Moorabool Basin up to 23% of run-off may be captured by small catchment dams in a dry year.

Potential future growth in small catchment dams would also lead to a greater proportion of streamflow being intercepted.

To inform the Central and Gippsland Region Sustainable Water Strategy, a study was commissioned examining how climate change and continued growth in small catchment dams could impact downstream water availability. Woollen Creek, an upstream tributary in the Moorabool catchment, was one of three catchments assessed. In this catchment the study found that, in a dry year, the proportion of run-off intercepted by small catchment dams could increase from 17 to 30 percent (based on a scenario of moderate growth and climate change).

The Victorian Government is proposing to develop a framework for monitoring risks to water resources from cumulative growth in small catchment dams, focusing on catchments with a high density of dam development (hot spots) while also keeping track of emerging hot spots (see **Section 8.5**).

Changes in water availability

Long-term water availability in the Barwon and Moorabool basins is declining (**Figure 12.5**). Total water availability has declined by 11 per cent in the Barwon Basin and 19 per cent in the Moorabool Basin when the historical inflow record used for the last Sustainable Water Strategy is compared to the 1975 baselines (DELWP, 2020b).

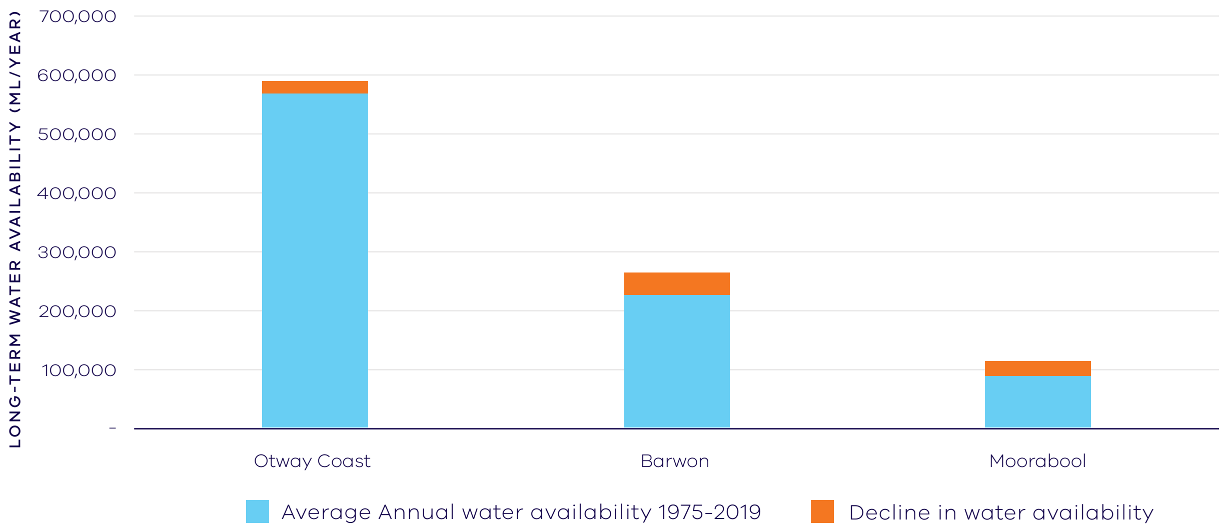


Figure 12.5: Long-term average annual water availability and decline in the Barwon, Moorabool and Otway basins

40 The percentages represent the median reduction in annual runoff between 1975–76 and 2017–18. In the Moorabool River the annual reduction in run-off ranges between 4% and 23%, in the Barwon Basin the range is between 3% and 10% and for the Otway Coast Basin it is between 1% and 3%. This was calculated using data prepared for the 2017–18.

Future water projections

Low, medium and high climate change scenarios to the year 2065 were used to represent potential future water availability in the Barwon, Moorabool and Otway basins.[41] There is a small increase in the average future water availability for the low climate change projection when compared with the post-1975 historical climate reference period, and significant declines under medium and high climate change projections (**Table 12.2**).

For additional information on climate change projections for all basins in the Barwon-Moorabool and Otways sub-region, please refer to **Further information** at the end of this document.

Table 12.2: Climate change scenarios (RCP8.5) to the year 2065

Basin	Post-1975 reference period (GL/year)	Post-1997 reference period (GL/year)	Low climate change projection (GL/year)	Medium climate change projection (GL/year)	High climate change projection (GL/year)
Moorabool	90	57	94	74	49
Barwon	226	155	224	177	119
Otways	570	503	543	480	331

12.4 Cities and towns

The City of Greater Geelong, City of Ballarat and other towns in the sub-region are facing significant population growth combined with reduced water inflows to their storages due to climate change. Coastal towns must manage their water supplies in the face of highly variable seasonal populations, which results in significant variation in water demands during the year.

Geelong may need new water supplies this decade; this Strategy is proposing further upgrades to the Melbourne-to-Geelong Pipeline and a focus on IWM. Barwon Water is considering various ways to use and find water in the future as it prepares its next Urban Water Strategy.[42] Given the limited availability of unallocated water in the region — volumes are too small and not in suitable locations, meaning they are not a cost-effective source of urban supply — and consistent with community preferences, Barwon Water has already ruled out some options, including taking more water from the Gellibrand River or other new surface water or new groundwater supplies.

Victoria's water grid does not connect Ballarat directly to the Melbourne system, which limits opportunities to access desalinated water. Options for Ballarat to indirectly benefit from desalination and take a larger share of water from the Lal Lal Reservoir are also limited because of the pressing environmental needs of the Moorabool River and because Geelong will also continue to rely on Lal Lal Reservoir to supply its growing demands, despite Geelong's connection via the water grid to Melbourne. This Sustainable Water Strategy is proposing continued integrated water management of Ballarat's supplies from the Central sub-region. Other options to secure Ballarat's water future, including connection to the water grid in northern Victoria, will be considered by Central Highlands Water in its next Urban Water Strategy.

41 Future water availability projections were made using RCP8.5 (see **Appendix D**), in accordance with the *Guidelines for assessing the impact of climate change on water availability in Victoria* (DELWP, 2020a).

42 For further information, see **https://www.waterfuture.barwonwater.vic.gov.au.**

Greater connection to the Melbourne system

Current urban water supplies may be insufficient to reliably meet demand in the Greater Geelong system within the next decade. Additional access to the Melbourne connected system will provide greater water security for Geelong, by better using the water grid, allowing water to move to where it is needed most, and reducing Geelong's reliance on the Moorabool River — the most flow-stressed river in the state. In turn, this will allow water to be returned to the Moorabool River and the Traditional Owners, the Wadawurrung.

Proposed direction 12-1:

- **The Victorian Government proposes a small increase to Barwon Water's share of water from the Melbourne supply system, and upgrades to the Melbourne-to-Geelong Pipeline within five years, to make better use of the water grid and provide greater water security for Geelong. This would also allow water to be returned to the Moorabool River, the most flow-stressed river in the state, and its Traditional Owners, the Wadawurrung.**

Integrated water management

The sub-region includes large new areas of population growth, particularly in the west and north of Geelong and around Ballarat. There are opportunities here for integrated water management to improve the use of local sources of water, including stormwater and recycled water, minimising the need to import potable water in the long term.

Opportunities to use more stormwater, groundwater and recycled water, where fit for purpose, are also available in existing urban areas, to reduce reliance on existing drinking water supplies.

The City of Ballarat's IWM Plan proposes a number of small, medium and larger scale opportunities to better use stormwater, groundwater and recycled water (Central Highlands Water et al., 2018). In addition, all precinct structure planning for new major growth areas shall incorporate IWM planning to support greater use of these water sources and reduce reliance on existing potable sources.

Proposed direction 12-2:

- **The Victorian Government proposes to implement the integrated water management plan for the northern and western Geelong growth areas, to help build the sub-region's water resource resilience.**

Proposed direction 12-3:

- **The Victorian Government proposes to continue to implement the IWM Plan for Ballarat, to help build the sub-region's water resource resilience.**

Proposed direction 12-4:

- **The Victorian Government proposes to progress a review of the institutional, legislative and regulatory arrangements for managing stormwater as a resource in the Lower Barwon.**

Image: Buckley Falls , Highton, Geelong, Wadawurrung Country

Integrated Water Management for Geelong's northern and western growth areas

New growth areas in the north and west of Geelong, which will become home to more than 110,000 new residents and a variety of new businesses and industries over the next 50 years, will be planned and built applying integrated water management. More than one-third of the total expected population growth in Barwon Water's service area will occur here. Clever and creative urban design for these areas will generate a green, liveable city and build the sub-region's water resilience. This aims to avoid any long-term net increase in imported potable water to the growth areas. Instead, new sources of water would support environmental and Traditional Owner values. The main features of the North and West Geelong Integrated Water Management Plan include the following:

- Class A recycled water will be delivered via a purple pipe network to homes, local industry and open spaces to reduce the future demand for potable water supplies by 3,400 million litres/year. Pending further investigation, this could also enable the provision of recycled water for environmental flows in the Moorabool river as pumped groundwater contributions from the Batesford Quarry decline or support irrigated agriculture, horticulture and viticulture in the Moorabool Valley.[43]
- Passively irrigated street trees, swales[44] and enhanced-infiltration billabongs will retain 4.4 gigalitres per year water in the landscape and support greater tree canopy of an additional 85 hectares, thus enriching local urban identity and landscape character.
- Local waterways will be naturalised and rehabilitated, including vegetation improvements to the Barwon and Moorabool rivers and Cowies Creek. This will create high-value green corridors and increase biodiversity.
- In the long term, the capture and transfer of treated stormwater from wetlands in the development will supplement drinking water supplies by more than 5 gigalitres over 30–50 years (subject to investigations confirming the viability of this proposal).

Image: Bridge over Barwon River, South Geelong, Wadawurrung Country

43 Following the Batesford Quarry decommissioning expected late this decade, the contribution of groundwater pumped from the quarry and transferred to the Moorabool River downstream to the environmental flow will need to be replaced (see **Section 12.7**).

44 Swales are shallow, vegetated open channels that convey and treat stormwater.

Progressing Integrated Water Management for Ballarat

The Ballarat City Integrated Water Management Plan was developed in partnership between Central Highlands Water, Corangamite Catchment Management Authority, City of Ballarat and the Department of Environment, Land, Water and Planning. The plan aligns with and enables the delivery of Water for Victoria objectives by targeting:

- diverse water sources to achieve water security
- strategic investments in wastewater
- better stormwater management for a healthy and resilient urban environment and community
- partnerships across government to support healthy and resilient urban landscapes
- improved urban planning to help deliver integrated water management
- water-use efficiency to support integrated water management planning
- priorities for regional waterway health.

Implementation of the plan will rely on collaboration between organisations to deliver actions including expansion of Ballarat's recycled water network, third pipe alternative water supplies into the new Ballarat West employment zone, and investigating a stormwater harvesting and aquifer recharge scheme.

One specific measure being applied in the Ballarat West growth area is requiring new residential connections to achieve a drinking water demand reduction measure. Most properties are achieving this by installing rainwater tanks. This growth area will build 10,000 new homes in the next decade, and through this requirement each household's drinking water demand will reduce by up to 30 kilolitre per year. As a result, at full development 300 megalitres per year less water will be needed from conventional sources compared to standard servicing approaches.

Integrated Water Management

Deakin University is implementing a $7.8 million IWM plan for its Waurn Ponds campus, extending Barwon Water's Class A recycled water network to irrigate sports fields and campus grounds, thus reducing potable water use by 75 megalitres per year.

A $2 million project to provide high-quality, fit-for-purpose recycled water at the National Trust's Barwon Park at Winchelsea will transfer 80 megalitres per year of recycled water to Barwon Park for irrigation.

Almost 7,500 homes in Armstrong Creek and Torquay North are connected to Barwon Water's Class A recycled water network. Using recycled water to water gardens, flush toilets, wash cars and irrigate public open space in these growth areas is saving 400 megalitres of drinking water per year. An estimated 25,000 homes will be supplied with recycled water when these growth areas are fully developed.

Roof water harvesting

The Otway Basin has benefited from case studies demonstrating that roof water harvesting could help reduce demand from the Gellibrand River. Great South Coast Integrated Water Management Forum projects in train include the Wannon Water–led Albert Park roof water harvesting project, which will save approximately 15 megalitres per year. This project builds on the successful Warrnambool roof water harvesting initiative, which in an average year harvests all the annual water needs of the 250 properties it is connected to, and is planned to eventually include 3,000 new homes in an urban catchment, re-using approximately 471 megalitres of rainwater per year.

Groundwater

Over the past 30 years, the Barwon Downs borefield was a crucial backup supply source for Greater Geelong during times of drought. In 2007, at the height of the worst drought on record, the Geelong area was placed on Stage 4 water restrictions, as water storages dropped to just 14 per cent of capacity. During this time, the only available backup source was Barwon Downs. It was used heavily during this period, at times supplying more than 70 per cent of Geelong's daily water requirements. Without this, Geelong would almost certainly have run out of drinking water.

Since then, large-scale projects such as the Melbourne-to-Geelong Pipeline and the Anglesea borefield have diversified and increased Geelong's water resources, helping the city become more resilient to climate variability. The Barwon Downs borefield was last used in 2016, and only briefly, to top up storage levels during a record dry summer.

In 2017, environmental impacts from historical management of groundwater pumping were identified. Southern Rural Water issued a Notice (under section 78 of the *Water Act 1989*) in September 2018 to require the development of a Remediation and Environmental Protection Plan for Boundary Creek, Big Swamp and surrounding environments impacted by past groundwater pumping.

In March 2019, Barwon Water withdrew an application to renew the Barwon Downs licence, meaning it no longer has a licence to extract groundwater from the Barwon Downs borefield. The focus now for Barwon Water is seeking alternative sources for urban need and improving environmental conditions for Boundary Creek and Big Swamp (Yeodene Peat Swamp). In March 2020, Barwon Water began implementing its Remediation and Environmental Protection Plan to remedy the environmental impacts of past groundwater extraction from the Barwon Downs borefield. Barwon Water's remediation efforts and Southern Rural Water's oversight of the works is informed by independent technical experts and the community.

Community interests around the use of groundwater resources to support urban needs are longstanding. The commitment of community groups in the region has been instrumental in understanding the impacts of pumping and the need for remediation. The community believes there is a need for their ongoing involvement to inform government's understanding of resources and the impacts of pumping. Barwon Water and Southern Rural Water are engaging with the local community to ensure local knowledge informs the implementation of actions to remediate the impacts on the environment. This process is a step towards understanding how engagement with community on resource management can work.

Barwon Water is now implementing a remediation and environmental protection plan, which includes:

- building hydraulic barriers and maintaining supplementary flows to Big Swamp and Boundary Creek, to mitigate the effects of acid sulphate soils[45]

45 Acidification takes place due to the drying and wetting of the acid sulphate soils in the area. Actions under the remediation plan aim to reduce the risk and occurrences of acid being flushed into Boundary Creek in the long term.

- constructing additional groundwater-monitoring bores and stream gauges across the aquifer region
- installing a new stock-water pipeline to serve affected landowners along Boundary Creek
- monitoring macro-invertebrates and vegetation
- continuing real-time monitoring of pH, *E. coli*, water quality and flow in Boundary Creek.

Pleasingly, the groundwater levels in the lower tertiary aquifer are continuing to recover, with levels in some parts of Big Swamp now artesian, meaning that the groundwater is returning to sufficient pressures to help keep these parts of the swamp wet and prevent the activation of acid sulphate soils.

Despite this progress, there is still a lot of work to do to remediate the environmental damage resulting from the groundwater extraction. This demonstrates the importance of having diverse and climate-resilient sources of water before they may be needed to support critical human needs, to protect fragile environments such as groundwater and rivers during times of drought.

The current Permissible Consumptive Volume is set at 239 megalitres per year, which represents the licence volume for agricultural use. Barwon Water has ruled out the use of the Barwon Downs borefield as a source of urban supply, in planning for their water future and preparing their next Urban Water Strategy.

Aquifer storage recovery

Using high-quality recycled water to replenish groundwater supplies could be an innovative way to expand the beneficial uses of recycled water, and further protect groundwater resources in the sub-region.

Aquifer storage and recovery means the controlled infiltration or injection of water into an aquifer for later extraction, or 'recovery', either via the same groundwater well or another well.

Preliminary investigations show that aquifers at Anglesea could be suitable for aquifer storage recovery, given their proximity to the Black Rock Water Reclamation Plant and its existing Class A recycled water treatment facilities and transfer infrastructure. Recycled water treatment processes at Black Rock could be upgraded, and transfer infrastructure expanded to allow the transfer of high-quality recycled water to Anglesea.

This could enable aquifer storage and recovery in the upper Eastern View Formation aquifer, which would allow high-quality recycled water to replenish and further protect the security of groundwater resources by minimising the risk of reaching environmental triggers due to extraction for potable water from the lower Eastern View Formation aquifer.

Further exploration of these concepts with environmental and health regulators, technical experts, community members and other groups would be required before any scheme could be implemented.

12.5 Water for agriculture

Recycled water is used for a range of agricultural purposes across the sub-region, including wineries, turf farms and flower farms.

Works are under way to expand the supply of recycled water from the Portarlington Water Reclamation Plant to more agricultural customers on the Bellarine Peninsula. Further expansion of the scheme would involve construction of a reverse-osmosis treatment plant to improve the quality of the recycled water, enabling it to serve high-value agriculture and tourism on the Bellarine.

Exploration of opportunities to expand the supply of recycled water from the Black Rock Water Reclamation and Class A Recycled Water Plant to the Thompson Valley for agricultural purposes also continues.

Construction of a new wastewater treatment and recovery plant in the Moorabool Valley as proposed in the Integrated Water Management Plan for the northern and western Geelong growth areas could also attract urban agricultural enterprises such as intensive food production.

12.6 Water justice for Traditional Owners

Traditional Owners have a responsibility to care for Country, including lands and waters. When Country is healthy and cared for, it supports healthy people and healthy economies, which benefits everyone. Traditional Owners with Registered Aboriginal Party status in this sub-region are the Wadawurrung Traditional Owners Aboriginal Corporation and Eastern Maar Aboriginal Corporation. See **Section 4.2** for more details from the Wadawurrung Traditional Owners Aboriginal Corporation on their contributions to the development of this discussion draft Strategy and their aspirations for water.

This Strategy will play a significant role in returning water to Traditional Owners, as well as strengthening and developing agreement-making between Traditional Owner groups, water corporations and government agencies. Most opportunities to return river water to Traditional Owners in the Barwon, Moorabool and Otways sub-region will be realised as new manufactured sources of water are added to the water supply system (see **Section 8.1**).

In the Barwon, Moorabool and Otways sub-region, the Victorian Government proposes to return water to the Wadawurrung Traditional Owners Aboriginal Corporation from rivers within its Registered Aboriginal Party boundary, including freeing up water in the Moorabool River and/or Barwon River as other new sources are found for urban customers supplied by Barwon Water and Central Highlands Water.

The Victorian Government also proposes continuing the partnership between Barwon Water and Wadawurrung Traditional Owners to rehabilitate the 66 hectares of public open space adjacent to the Barwon River that is currently divided by the heritage-listed ovoid sewer aqueduct at Breakwater. The project, known as Porronggitj Karrong, will create an area that is unique for its high ecological, heritage, cultural and recreational values.

In the Barwon, Moorabool and Otways sub-region, the Victorian Government proposes to return water to the Eastern Maar Aboriginal Corporation from rivers within its Registered Aboriginal Party boundary, including:

- freeing up water in the Barwon River as other new sources are found for Geelong
- making available a portion of the unallocated surface water in the Otways Basin (including the Gellibrand River).

12.7 Water for the environment

The two major river systems in the sub-region, the Barwon and Moorabool, are both flow-stressed. The major threats to their environmental values include:

- insufficient streamflows to maintain existing environmental values, and subsequent effects on all other values that rely on a healthy river
- livestock causing damage to riverbank vegetation and degrading in-stream habitat
- barriers to fish passage and migration due to reductions in streamflow and physical barriers such as dams and weirs
- urban growth in the lower Barwon that, if not managed appropriately, could result in increased stormwater run-off, leading to degraded water quality, algal blooms, soil disturbance, bank erosion and degradation of native riparian and estuarine vegetation.

Moorabool River

The Moorabool River is highly flow-stressed and requires urgent recovery of water for the environment. The existing Moorabool River environmental entitlement, which provides an annual average of approximately 2.5 gigalitres, only provides water to critical habitat in the upper reaches of the river over summer; it can deliver only 25 per cent of the minimum recommended streamflows, and only 10 per cent of the quantity that the river really needs.

During most summers, disconnected pools develop in the lower reach of the Moorabool; if no flows are provided, the pools dry out completely within a week, resulting in fish deaths. To help prevent this, additional water is needed to help provide minimum flows to maintain water in these pools.

Water recovery will maintain or improve the environmental values of the Moorabool River and provide benefits for Traditional Owner cultural values, and broader economic and social values. An additional 2,640 megalitres of water recovery in the west branch within five years, a new entitlement in the east branch of 700 megalitres, and improvements to the reliability of the existing entitlement, are all needed just to maintain flow and water quality and protect the highest priority ecological values (native fish and platypus) (**Table 12.3**). The current 3,000-megalitre discharge from the Batesford Quarry must also be replaced with water from other sources just to maintain the status quo. This could be reduced to 1,500 megalitres if channel seepage is remedied (see proposed directions 12.5 and 12.6).

Proposed direction 12-5: Moorabool River

- **The Victorian Government proposes an additional environmental entitlement of 2,640 megalitres under dry conditions for the Moorabool River west branch and 700 megalitres for the Moorabool River east branch within five years, to improve waterway health by maintaining water quality and preventing fish deaths.**

Proposed direction 12-6: Moorabool River

- **The Victorian Government proposes further additional recovery of water for the environment of 3,860 megalitres for the Moorabool River within 10 years, to improve waterway health and support thriving native fish and platypus populations.**

These could be achieved through a combination of:

- options to transfer water from Barwon Water's bulk entitlement in Lal Lal Reservoir to improve waterway health
- options to transfer water from Barwon Water's bulk entitlement in Bostock Reservoir to improve waterway health
- using stormwater or recycled water to reduce non-drinking demands for river water and as sources for environmental flows if appropriate (to contribute to the 10-year targets)
- allocating a share of river water to the environment each time a new water source is brought online (to meet the 10-year targets).

The first two options are dependent upon completion of Melbourne-to-Geelong Pipeline works for Barwon Water, which will increase Geelong's water supplies.

Table 12.3: Proposed targets and options for environmental water recovery in the Moorabool River

Outcome	Water recovery target (ML/yr) cumulative#	Timeframe
West branch: Protect highest priority ecological values (native fish and platypus) Ensure the river continues to flow and does not dry out Provide enough water for species to survive, reducing the risk of fish deaths Maintain water quality, and pool and riffle habitats Trigger spawning migrations for migratory native fish species (tupong, eels, Australian grayling, galaxiids)	2,640 under dry conditions	Up to 5 years
Provide conditions that will enable native fish and platypus populations to thrive in wet years, in order to increase their resilience to lower flows in dry years	6,500	Up to 10 years
Permanently protect priority environmental values	17,130	50 years
East branch: Protect highest priority ecological values (native fish and platypus) Ensure the river continues to flow and does not dry out Provide enough water for species to survive, reducing the risk of fish deaths Maintain water quality, and pool and riffle habitats Trigger spawning migrations for migratory native fish species (tupong, eels, Australian grayling, galaxiids)	700	Up to 5 years

Priority is for high-reliability water.

To achieve the greatest possible environmental outcomes from any water recovery or improvements in flow regimes, complementary works or measures may be required. In the Moorabool River near Batesford Quarry, work is required to restore the channel, which is currently lined with cracked concrete. Removing the concrete and lining the channel with clay to prevent seepage would prevent losses from the river of approximately 5 megalitres per day, and would improve the health of the reach. It is also vital to secure water in the long term, as the existing discharge of approximately 9 megalitres pumped from the quarry every day and discharged back into the river (under Environment Protection Authority licence), which helps to offset current seepage losses, is not guaranteed after the quarry closes.

Proposed direction 12-7: Moorabool River

- **The Victorian Government proposes investigations to consider the impacts to the Moorabool River from the closure of the Batesford Quarry within five years, including, but not limited to, works to remove the concrete and rehabilitate the channel in the relevant reach of the river to prevent losses of flow and protect environmental and Traditional Owner cultural values.**

Barwon River

The Barwon River is highly flow-stressed and requires urgent recovery of water for the environment. The existing Upper Barwon River environmental entitlement of 1 gigalitre is small and delivers only a small portion of the summer streamflow recommendations for the upper Barwon's east and west branches, with diminishing returns as it moves downstream, in most years. There is not enough water in the entitlement to meet the majority of the winter streamflow recommendations.

Water recovery will maintain or improve the environmental values of the Barwon River, and provide benefits for Traditional Owner cultural values, and broader economic and social values. An additional 2,336 megalitres of water recovery within five years is needed just to prevent cease-to-flow events in the river, ensure more continuous river flows, maintain water quality and provide enough water for species to survive (**Table 12.4**).

Proposed direction 12-8: Barwon River

- **The Victorian Government proposes an additional environmental entitlement of 2,336 megalitres per annum for the Barwon River within five years, to improve waterway health by preventing cease-to-flow events, maintaining water quality and providing water for important species to survive.**

Proposed direction 12-9: Barwon River

- **The Victorian Government proposes further additional recovery of water for the environment of up to 2,664 megalitres for the Barwon River within 10 years, to improve waterway health by better maintaining critical values over summer and trying to keep the river flowing in the mid-reaches over summer.**

These could be achieved through a combination of:

- options to enhance the sustainable use of the Anglesea borefield, including the potential use of recycled water, if fit-for-purpose, for aquifer storage and recovery, to reduce the amount taken from the Barwon River without impacting on urban water security
- using stormwater or recycled water to reduce non-drinking demands for river water (to contribute to the 10-year target)
- allocating a share of river water to the environment each time a new water source that can service the same area is brought online (to meet the 10-year target).

The Long-Term Water Resource Assessment showed a decline in water available for the rivers in both the Barwon and Moorabool systems. This has a cumulative effect on the lower Barwon wetlands and an unknown effect on water availability and the ability to water the wetlands. Further work is required to update the environmental watering recommendations for the Ramsar-listed lower Barwon wetlands.

Proposed direction 12-10: Lower Barwon wetlands

- **The Victorian Government proposes investigations to update the watering recommendations for the Ramsar-listed Reedy Lake and Hospital Swamps by 2023, including development of a water–salt balance model, to protect and improve these wetlands for all uses.**

Table 12.4: Proposed targets and options for environmental water recovery in the Barwon River

Outcome	Water recovery target (ML/yr) cumulative#*	Timeframe
Prevent cease-to-flow events in the river and ensure more continuous river flows Maintain water quality and provide refuge pools during summer critical for survival of species including platypus, growling grass frog, fish and bugs Provide opportunities for fish migration and movement of other species between reaches	2,336	Up to 5 years
Better maintain critical values over summer and have a better chance of keeping the mid-reaches of the river flowing.	5,000	Up to 10 years
Provide migration cues and opportunities for fish and other species to breed, including eels, spotted galaxias and Australian grayling	18,301	50 years
Secure long-term protection of priority environmental values	28,685	50 years

Does not include data for Lower Barwon River through Geelong or Lower Barwon wetlands.
* Priority is for high-reliability water.

Image: Barwon Rivers meets the Leigh River, Inverleigh, Wadawurrung Country

Geelong values project

The Barwon River is one of Geelong's most significant natural assets. It provides extensive areas of natural public open space, and supports numerous recreational activities, such as enjoyment of nature, walking, cycling, fishing, rowing, paddle sports and game hunting (in the lower Barwon wetlands). At the lower end of the Barwon River system are the internationally listed wetlands that form part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site.

The Barwon River at Geelong is also reliant on flows from the Leigh and Moorabool river catchments.

A decline in environmental flows has contributed to a decline in water quality in the lower Barwon through Geelong, particularly in summer and autumn, when it is most used and valued by the local community. Low flows and a lack of periodic flushing have led to more frequent and severe outbreaks of blue-green algae in the long pools of the lower reaches. The low flows in this generally shallow reach of the river pose a longer term threat to primary and secondary recreational use, with potential health and economic ramifications.

The Corangamite Catchment Management Authority has commissioned an independent study, first to model a range of climate and water recovery scenarios on river flows in the lower Barwon and Moorabool rivers and, second, to examine the economic and social benefits of increased environmental flows in the Barwon River through Geelong and the lower Moorabool River.

The initial findings of this work have shown that, under different climate scenarios, improved flows in the Moorabool, Leigh and Barwon rivers can help protect water quality, maintain water levels and reduce the risk of algal blooms in the lower Barwon River through Geelong. This is expected to lead to both social and economic benefits to the community of Geelong. The value of these benefits is currently being modelled and will be available later this year after the report is completed.

Image: Head of the Schoolgirls Regatta on the Barwon River, Geelong, Wadawurrung Country

A fish barrier prioritisation and review process has found that reinstating fish passage at the Buckley Falls/Baums Weir is the highest priority fish barrier project in the Corangamite area. Numerous migratory species will benefit from fish passage at the site, which would open a further 160 kilometres of the Barwon River and numerous tributaries to fish movement. Since the tidal barrage fishway was installed 20 kilometres downstream, many migratory fish have been aggregating downstream of Buckley Falls, as they cannot ascend the barrier except when the river is in flood, which may happen once in five years. Fish species that will benefit from installing fish passage at Buckley Falls include the threatened Australian grayling and other migratory species such as lamprey, tupong, eels, various galaxiid species, smelt, gudgeon, blackfish and pygmy perch.

In the upper reaches of the Barwon, there is a significant impact from willows and reed sweet-grass, which cause choke points in the waterway that inhibit water flow. Unrestricted livestock access is destabilising riverbanks and diminishing water quality.

Proposed direction 12-11: Barwon River

- **The Victorian Government proposes to improve waterway health and the effectiveness of held environmental water in the Barwon River.**

This could be achieved through a combination of:

- investigating options to provide fish passage at Buckley Falls
- restoring channel form and removing willows and reed sweet-grass from the upper Barwon River
- investigating the risks of releasing higher volumes of water and prioritising works to enable higher fresh flows to be released. (This has implications for how the water would be released (baseflows or freshes) and the results that would be achieved, rather than the ability to release the additional allocations to the river.)

Sharing benefits in the Barwon and Moorabool rivers

In a drying climate it is more important than ever to make the best use of all sources of water in local supply systems, in order to improve waterway health and share the benefits. For example, Barwon Water works closely with the Corangamite Catchment Management Authority to ensure that the timing of its water transfers brings maximum environmental benefits and helps meet low-flow recommendations in sections of the Moorabool River over summer. This is referred to as using consumptive water en route.

Temporary trades between water corporations and the Victorian Environmental Water Holder can also benefit the environment. Central Highlands Water, Wadawurrung, the Victorian Environmental Water Holder and the Corangamite Catchment Management Authority will continue to work together to progress learnings on recent joint water releases, in an effort to develop flexible arrangements for temporarily transferring additional water from Central Highlands Water to the Victorian Environmental Water Holder and/or the Wadawurrung in the Moorabool system at Lal Lal Reservoir. This water could come from water grid interconnection transfers or from water made available under locally average-to-wet conditions. When released it can improve flows and the ability of the river and the life dependent on it to withstand dry periods. Previous work demonstrates this can be done without affecting local water security and urban customer pricing, while bringing important environmental waterway and cultural flow benefits.

Some water-sharing rules are based on assumptions inconsistent with actual water availability. For example, reduced inflows to Lal Lal Reservoir due to a drying climate have triggered a reduction in passing flows more often than was intended under historical arrangements, harming the health of the Moorabool river. Water from environmental entitlements should not be relied upon to remedy poor water quality or provide baseflows and low flows that were intended to be met from passing flows. The passing flow rules for Lal Lal and West Barwon Reservoirs are being reviewed, to try to optimise the benefits provided by passing flows.

Proposed direction 12-12:

- **The Victorian Government proposes improving water management in the Barwon and Moorabool rivers, to benefit the environment, Traditional Owner cultural values and other shared benefits, within five years.**

This could be achieved through a combination of:
- using consumptive water en route
- temporarily transferring water to the Victorian Environmental Water Holder or Traditional Owners when conditions allow
- operating flexibly and efficiently
- removing the cap on releases from Lal Lal Reservoir under the Moorabool River environmental entitlement, to provide greater flexibility for environmental water managers
- reviewing options to optimise passing flow rules at Lal Lal Reservoir and West Barwon Reservoir and provide shared benefits for the environment, Traditional Owners, stock and domestic users and recreational users.

Leigh and Yarrowee rivers

The Leigh and Yarrowee rivers form part of the Barwon River system and are important contributors to the internationally significant wetlands at Lake Connewarre, Reedy Lake and the lower Barwon further downstream. Key threats to the environmental values of the Leigh and Yarrowee rivers include stormwater from increased urbanisation, and consequent problems of erosion and poor water quality.

The Ballarat South Wastewater Treatment Plant discharges into the Yarrowee River under an Environment Protection Authority licence. On average the treatment plant discharges 20 megalitres per day, totalling approximately 7,430 megalitres in the 2019–20 financial year. For the upper Barwon, Leigh and Yarrowee rivers, the environmental flows study highlights the value of the treated water from the plant, as does the Central Region Sustainable Water Strategy, which committed to discharge 2,000 megalitres of recycled water to the Yarrowee River each year.

The environmental flows study also noted that the timing of the current discharges from the Ballarat South plant is misaligned with environmental flow requirements. With appropriate flow modification and water quality management, in future the discharges could play an important role in the long-term supply of environmental water to the Barwon River system.

The study recommended an investigation into ways to improve water quality and modify the discharge regime of the Ballarat South Wastewater Treatment Plant, to provide a more varied flow regime and improve water quality in the Barwon system.

Proposed direction 12-13: Yarrowee River

- **The Victorian Government proposes to investigate options for stormwater and recycled water discharge from the South Ballarat Wastewater Treatment Plant into the Yarrowee River for environmental benefit, and continuation of current discharge.**

Anglesea River

Between 1963 and 2015, Alcoa operated the Anglesea Power Station, during which time groundwater was extracted for use in power generation, and subsequently released into the Anglesea River.

Alcoa is responsible for preparing a plan for the rehabilitation of the former Anglesea coal mine, to achieve a safe, stable and sustainable landform. Rehabilitation may involve filling the mine void, which could hold around 16 gigalitres of water. Alcoa is investigating the feasibility of using local groundwater for this. Fit-for-purpose recycled water is also an option, but would need investment in infrastructure, including a pipeline to Anglesea from the Black Rock Water Reclamation Plant.

In response to the power station closure and releases ceasing, a technical investigation determined the main impact would be a reduction in the Anglesea River's water levels by approximately 1 metre in summer, exposing mudflats and parts of the channel in the lower estuary and Coogoorah Park. This in turn increases the risk of future acid events in the river by exposing coastal acid sulphate soils in Coogoorah Park. These impacts are likely to be exacerbated by reduced rainfall due to climate change.

Since 2016, water has been extracted from the Anglesea River during winter and spring, stored in a pond on the former Alcoa mine site, and released back into the estuary over the drier summer months. This additional flow helps supplement natural inflows, maintaining water levels in the estuary over summer to provide social, economic and environmental benefits for the local community.

The Victorian Government is continuing to work with Alcoa to identify long-term management options for the Anglesea River and estuary.

Painkalac Creek

Painkalac Creek flows from the Otway Ranges through Aireys Inlet, ending in a coastal lagoon system, which attracts the spotted green frog and the eastern banjo frog (pobblebonk). Flows in the Painkalac Creek and estuary are modified by the Painkalac Reservoir, which supplied potable water to the towns of Aireys Inlet and Fairhaven until 2016.

When Painkalac Creek Reservoir ceased supplying potable water in 2016, the reservoir became a popular recreation site, and allowed the Corangamite Catchment Management Authority and Barwon Water to work together to coordinate releases from the reservoir for environmental benefits in the creek and estuary.

These releases occur throughout the year to mimic natural flows as much as possible, prevent downstream reaches of the creek from drying out, help maintain water quality and habitat for fish, frogs and birds, and provide water for recreation. Releases can be timed to coincide with an artificial opening of the Painkalac Creek mouth by the Surf Coast Shire Council, to help sustain an open estuary mouth and reduce the risk of fish deaths.

Painkalac Creek is a great example of agencies working together to provide shared benefits for all users and maximise use of the resource.

Image: Anglesea River boat sheds, Wadawurrung Country

Image: Anglesea River, Anglesea, Wadawurrung Country

Proposed direction 12-14: Painkalac Creek

- **The Victorian Government proposes that Corangamite Catchment Management Authority and Barwon Water continue to work together to achieve environmental benefits in Painkalac Creek through coordinated releases from Painkalac Creek Reservoir.**

Gellibrand River

The Gellibrand River is an unregulated river, with recreational and environmental values as well as several significant cultural sites for the Eastern Maar. It provides water to the towns of Warrnambool, Camperdown, Lismore, Cobden and Colac, and ends in a coastal estuary at Princetown.

The Gellibrand River experiences ecological stress in the lower reaches during the summer, due to low flows. This is exacerbated by extraction from the river over summer, primarily for urban supply. The risk of low flows will grow as water availability continues to decline due to a drying climate. With current levels of water extraction, the environmental flow recommendations are achieved far less frequently than under natural conditions. For example, under current operations, summer low-flow recommendations for the lower reaches of the river (86.4 megalitres per day) were estimated to be met or exceeded on only 67 per cent of days in summer and 68 per cent of days in autumn. These flows are required to maintain the health of the river and the estuary.

Artificial openings of the Gellibrand River estuary usually occur when there is a threat of flooding and damage to agricultural land and infrastructure such as parks and roads. However, artificial openings can contribute to adverse environmental outcomes such as fish deaths. Wannon Water and the Corangamite Catchment Management Authority work together during an artificial opening to carefully manage river flows to reduce the risk of fish deaths.

The Western Region Sustainable Water Strategy (Victorian Government, 2011) recommended improving the environmental flows to the Gellibrand River as a priority action. To do this, the Gellibrand Summer Flows Improvement Project was undertaken, a partnership between Wannon Water, the Department of Environment, Land, Water and Planning, the Corangamite Catchment Management Authority, and Southern Rural Water. To date, the project has investigated a variety of options to reduce summer extraction from the Gellibrand River for urban use (Wannon Water, 2019). The options included substitution with groundwater from various sources, new storages for water harvested during winter, and measures to reduce summer demand.

Wannon Water has shortlisted several options for improving summer flows in the river. For these to be considered further, work is needed to better understand the environmental benefits for the river and estuary, and then account for these in a quadruple-bottom-line cost–benefit analysis.

This project's aim is to maintain a healthy Gellibrand River that is more resilient to a drying climate, and to increase security of drinking supply for major towns in western Victoria, such as Warrnambool. Given the limited availability of unallocated water in the region – volumes are too small and not in suitable locations, meaning they are not a cost-effective source of urban supply – and consistent with community preferences, Barwon Water has ruled out taking more water from the Gellibrand River to meet the growing needs of Geelong.

Proposed direction 12-15: Gellibrand River

- **The Victorian Government proposes to continue investigations to assess a preferred water supply augmentation option and implementation process to improve critical flows in the Gellibrand River through the summer low-flow period.**

This could be achieved through a combination of:

- assessing the expected environmental outcomes for each option to reduce take from the Gellibrand River (independent expert report)
- completing a quadruple-bottom-line cost–benefit analysis of the preferred options, to identify the best way to improve flows in the Gellibrand River.

13. Finalisation and implementation of the Strategy

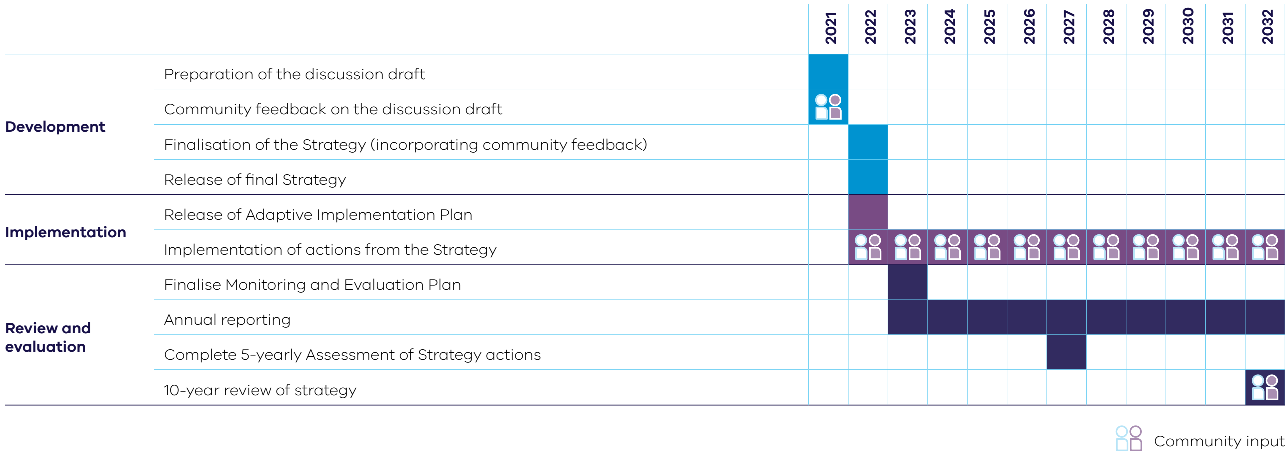
Image: Melbourne CBD overlooking the Yarra River, Wurundjeri Woi-wurrung Country

13.1 Finalisation

This discussion draft Strategy sets out the Victorian Government's proposed plan for meeting the short and long-term water needs of the Central and Gippsland Region. Following the community consultation period on this draft version, a final Strategy will be released in 2022, which takes into account the feedback received. The final Strategy will include all agreed policies, targets and actions; an adaptive implementation plan that specifies how each action will be implemented; requirements for further consultation to refine specific actions over time; and requirements for monitoring, evaluation and review.

A proposed timeline for all these stages is set out in **Table 13.1**.

Table 13.1: Timeline for finalisation, implementation, monitoring, evaluation and review of the Strategy



13.2 Proposed decision-making criteria

Decisions on policies and actions for the Strategy require consideration of many values, costs, benefits and risks. Clear criteria are needed when assessing different options against the provisions of the *Water Act 1989* and the objectives of the Central and Gippsland Region Sustainable Water Strategy, so that decision-making is consistent, transparent, efficient and balanced. The consultative committee established by the Minister has proposed that the following criteria be used to guide its decision-making on the directions and actions to be included in the final Strategy. That is, each action or direction would be assessed according to how well it:

- contributes to the strategic planning of the use of water resources in the region, as required under the *Water Act 1989*
- enables proactive planning for an uncertain future and preparations for a drying climate
- protects the integrity of existing water rights and entitlements (including the restoration of Traditional Owner custodial water rights) or defines and minimises, mitigates or offsets any material impacts and requires compensation by the beneficiary
- maximises the ability of entitlement holders to exercise choice and manage their own risk
- prioritises Traditional Owner outcomes
- protects or enhances ecological values of waterways and, when considered with other actions, maximises environmental and healthy Country outcomes
- takes a precautionary approach to managing water resources
- justifies the costs for affected groups — for current and future generations
- reflects the range of community values identified through the Strategy's consultation process.

13.3 Adaptive implementation plan

The implementation plan will clearly articulate how each of the final Strategy's actions and targets will be achieved in future. It will be a tool to help the Victorian Government, the water sector and Traditional Owners across the region successfully implement the Strategy. For each action, the plan will state who is responsible for implementation, how it will be funded, the timeframe for implementation, and any additional consultation required during implementation.

Adaptive management

Climate conditions and water availability are always variable, but other factors can also change quickly. We know from previous Sustainable Water Strategies that the implementation of actions can be affected by environmental, technological, social, cultural and economic considerations and uncertainties. Intense, frequent and overlapping disruptive events, which are increasingly likely in the Central and Gippsland Region in the future, also generate uncertainty. Responding effectively to such uncertainty will require regular monitoring and flexibility in long-term planning.

All the actions and directions included in the final Strategy will be locked in as definite commitments by the Victorian Government. At the same time, flexibility might be needed to implement some actions and directions successfully, as circumstances change and knowledge improves in future years. For example, the new Water Supply Readiness Roadmap proposed for publication in the final version of the Strategy will allow new water supply options to be brought forward, deferred or amended, to reflect new data or changing circumstances. Updated versions of the Roadmap will be published regularly, so that any changes required after publication of the final Strategy are transparent, with consultation on specific options built into future business cases and assessment processes. For some actions and directions, alternative ways of achieving the desired outcome may be provided, subject to further work during implementation to determine the preferred option.

Responsibility for implementation

Many organisations, including water corporations, catchment management authorities and Traditional Owners, are involved in water management in the Central and Gippsland Region. All will have a part to play in implementing the final Strategy.

The proposed roles and responsibilities for managing the region's water resources are set out in **Figure 13.1**. Responsibility for implementing each of the actions in the final Strategy will be based on these roles and responsibilities. The restoration of Traditional Owners' cultural responsibility and rights into the region's waterway management and planning will require strengthening agreement-making processes between the water sector and Traditional Owner groups, as well as additional funding for Traditional Owner groups. A cultural landscape approach will be important when implementing the final Strategy, as will providing appropriate resourcing and funding.

The Department of Environment, Land, Water and Planning has a statutory requirement to report on the implementation of all Sustainable Water Strategies in its annual report, which is tabled in Parliament.

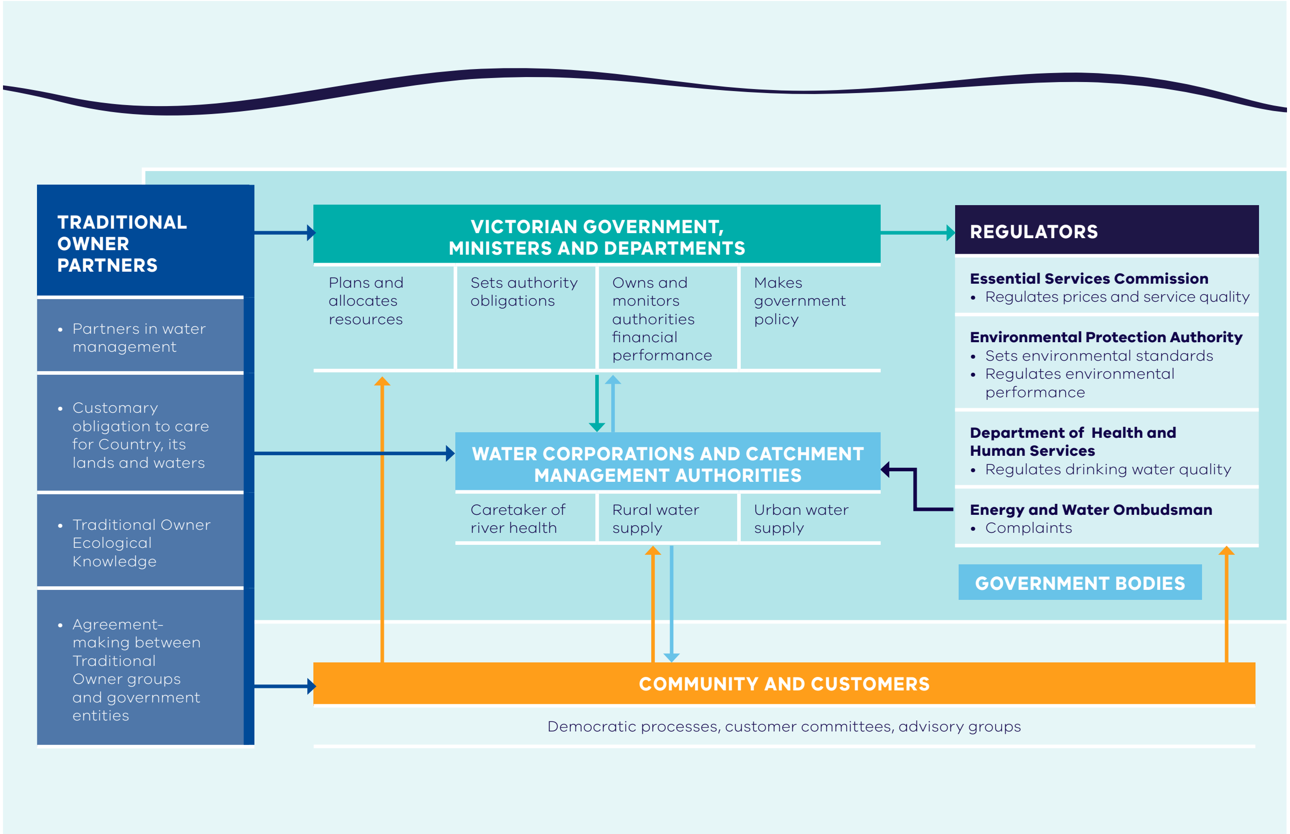


Figure 13.1: Roles and responsibilities for water regulation and management in the Central and Gippsland Region

13.4 Monitoring and review

Under the *Water Act 1989*, the Minister for Water may review a Sustainable Water Strategy at any stage, and must do so after 10 years.

Water for Victoria requires five-yearly assessments of all Victoria's Sustainable Water Strategies. These five-yearly assessments are intended to serve as an intermediate check of progress on each action prior to a full review.

A detailed monitoring, evaluation and reporting plan will be developed after the release of the final Strategy. In developing and implementing this plan, the Victorian Government will work with Traditional Owner groups, recognising the obligation of Traditional Owners to care for Country and their unique and sacred knowledge of Country derived from their connection.

Image: Jones Bay, Gippsland Lakes, Bairnsdale, Gunaikurnai Country

Image: Sale Common, Gunaikurnai Country

Abbreviations

DELWP	Department of Environment, Land, Water and Planning
EPA	Environment Protection Authority Victoria
EWSP	emergency water supply point
GL	gigalitre (one billion litres)
GMA	groundwater management area
IWM	integrated water management
LTWRA	long-term water resource assessment
LVRRS	Latrobe Valley Regional Rehabilitation Strategy
ML	megalitre (one million litres)
RAP	Registered Aboriginal Party
SWS	Sustainable Water Strategy
VEWH	Victorian Environmental Water Holder
Water Act	*Water Act 1989* (Vic)

Glossary

Aboriginal	'Aboriginal' and 'Torres Strait Islander' refer to different groups of peoples. 'Aboriginal' refers to the original peoples of mainland Australia. 'Torres Strait Islander' refers to the original peoples of the islands located in the Torres Strait. If describing people individually, 'Aboriginal people' or 'Torres Strait Islander people' is preferred (noting people would rather be called by their mob name). 'Indigenous people' can be used to describe Aboriginal and Torres Strait Islander people either individually or collectively.
Aboriginal water policy	Victoria introduced its first Aboriginal water policy as part of Water for Victoria (DELWP, 2016). It acknowledged cultural values for water and the need for economic development.
above-cap water	Water that remains in a system after limits on **diversions** have been reached; spills from storages and unregulated flows that cannot be kept in storage
algal bloom	A rapid increase in the population of algae in a **waterway**, often caused by excess nutrients (particularly phosphorus and nitrogen)
allocation	Water available to **water entitlement** holders (excluding **take-and-use licences**) in a given water season under the terms of their entitlement
aquifer	An underground layer of rock or unconsolidated material — gravel, sand or silt — that can store and yield very large volumes of usable water
availability	Water available for **allocation** to **consumptive uses** or the environment through the water entitlement framework
barrier	An artificial instream structure, such as a dam, **weir**, causeway or culvert, that restricts the migration and movement of fish or other biota and can interrupt transport of organic material and sediment
baseline	Conditions regarded as a reference point for the purpose of comparison
biodiversity	The number and variety of plants, animals and other living beings, including micro-organisms, across our land, rivers and oceans. It includes the diversity of their genetic information, the habitats and **ecosystems** in which they live, and their connections with other life-forms.
bore	A bore, well or excavation or any artificially constructed or improved underground cavity, used for the collection, storage or extraction of **groundwater**, groundwater monitoring, drainage or desalinisation of land, disposal of any matter below the surface of the ground, or the recharge of an **aquifer**

bulk entitlement	A right to use and supply water in a **waterway**, water in storage works of a **water corporation**, and groundwater. The bulk entitlement sets out the amount of water that can be taken or stored under specific conditions or specifications, up to a maximum volume. Water corporations and other specified bodies defined in the *Water Act 1989* can hold bulk entitlements.
cap	An upper limit on water that can be diverted from a **waterway**, catchment, basin or **aquifer**
carryover	An arrangement that allows a **water entitlement** holder to take unused water **allocations** from one season into the next season to use or trade. Carryover rules depend on the declared system in which allocations are held.
catchment	The region within which all rainfall flows, other than that removed by evaporation, into **waterways** and then to the sea or terminal lake
catchment management authority	A statutory body established under the Catchment and Land Protection Act 1994 (Vic). Catchment management authorities have responsibilities under both that Act and the Water Act for river health; regional and **catchment** planning and coordination; and **waterway**, **floodplain**, **salinity** and **water quality** management.
commercial and irrigation dam	A small dam (usually on a farm) that stores water for irrigation or commercial purposes. The use of a commercial and irrigation dam must be licensed.
confined aquifer	An **aquifer** overlain by impermeable material that restricts the upward movement of water. Confined aquifers are under pressure: when the aquifer is penetrated by a bore, the water rises above the top of the aquifer.
consumptive uses	All extractive uses of water by individuals, households, agriculture, industry and commerce
Country	Aboriginal culture revolves around relationships to the land and water. For **Traditional Owners**, Country is a part of who they are, just as they are a part of it. Country must be respected. Traditional Owners are authorised to speak for Country and its heritage.
Country plan, Caring for Country plan, Whole-of-Country plan	**Country** plans are one way for **Traditional Owners** to articulate their priorities and aspirations for looking after **Country**. These can be strategic plans that encompass physical and spiritual concepts of Country, provide a strategic basis for partnerships, and identify management actions and economic opportunities.
Crown land	Land held by the Crown (the King or Queen) in right of the State of Victoria. Crown land can be reserved for a particular public use, or unreserved. Unreserved Crown Land has not been set aside for a particular public use, although not all public land is Crown land.

cultural landscape	Australia forms a tapestry of interwoven cultural landscapes that are the product of the skills, knowledge and activities of Aboriginal land managers over thousands of generations. Cultural landscapes are reflections of how Aboriginal people engage with the world. The concept of a cultural landscape is a bridging tool, in this case one that aims to bridge the ontological differences between Indigenous and 'Western' world views, between natural resource management and caring for Country. This is required to take steps towards preventing the ongoing ontological violence that is perpetuated by the dominance of 'Western' approaches to managing Country. It enables a dialogue between **Traditional Owners** and government land managers within a framework that does not exclude one or the other world view.
declared water system	A water system declared in accordance with section 6A of the Water Act. In a declared water system, old water rights as well as **take-and-use licences** have been converted into unbundled **entitlements**.
diversion	Removal of water from a **waterway** — for example, via a pump
domestic and stock dam	A small dam (usually on a farm) that stores water for livestock, or domestic supply. Use of a domestic and stock dam does not require a licence, unlike a commercial or irrigation dam.
drought refuge	A site that acts as a refuge in areas affected by drought, by providing permanent fresh water for plants and animals
ecosystem	A dynamic complex of plant, animal, fungal and micro-organism communities and associated non-living environment interacting as an ecological unit
environmental entitlement	A continuing legal right to take and use water allocated under Part 4, Division 1A of the Water Act to maintain the Environmental Water Reserve and to preserve or improve the environmental values and health of water **ecosystems**
environmental flow studies	The study of flow requirements needed to sustain the ecological values of water-dependent **ecosystems** for a particular **waterway**. This information is used to inform policy, management and **allocation** of water resources.
environmental objective	An objective for the protection and, if necessary, restoration of a priority environmental asset or **ecosystem** function
environmental target	A target that must be met in order to achieve an ecological objective
environmental water deficit (shortfall)	The shortfall volume of water required to sustain a **waterway's** ecological values under current and/or future climate scenarios, and the volume of water that is actually supplied to the waterway
environmental water manager	A **catchment management authority** or Melbourne Water, which decides when and how to use **environmental entitlements** in partnership with the **Victorian Environmental Water Holder**, and how to manage and protect the **Environmental Water Reserve**

Environmental Water Reserve	Water set aside for the environment under Part 4A of the Water Act as an **environmental entitlemen**t, and through the operating conditions on any **bulk entitlement**, licence, permit, authority or management plan or via other provisions in the Water Act The Environmental Water Reserve helps to preserve the environmental values and health of water **ecosystems**, including their **biodiversity**, ecological function and **water quality**, and other uses that depend on environmental conditions.
evapotranspiration	The transfer of water from land to the atmosphere by transpiration from plants, evaporation from soil and open water surfaces, and evaporation from the wet surfaces of plants soon after rainfall
excess stormwater	The additional run-off created by an urbanised environment, compared to that of a non-urbanised environment, particularly by impervious surfaces.
fit-for-purpose water	Water of a quality that is appropriate for its intended use
floodplain	Low-lying land adjacent to a river or stream, with an **ecosystem** dependent on inundation from floods
flow	Water movement in a **waterway**
flow regime	The pattern of **flows** that changes over time and is characterised by the magnitude, timing, seasonality, frequency and duration of the flow. The main components of a flow regime are cease to flow, low flow, **fresh**, high flow and overbank flow.
freshes	Small pulses of water; a 'flush' of water through a **waterway**. These **flows** exceed the low flow and last for at least several days. Freshes are a key contributor to the variability of flows.
gigalitre (GL)	One billion (1,000,000,000) litres
groundwater	Water stored in an **aquifer**
groundwater availability	The ability of an **aquifer** to supply water for consumptive uses and the environment
groundwater management area (GMA)	An area that defines the extent and depth of aquifers containing usable quantities of **groundwater** and that are currently, or have potential to be, developed by licensed users. A GMA has **permissible consumptive volumes** that are set and may be declared as a **water supply protection area** under the Water Act.
hydrology	The scientific study of water and its movement, distribution and quality
inflow	Water flowing into a storage or **waterway**

integrated water management (IWM)	Water management that considers the urban water cycle as a single integrated system, in which all urban water flows are recognised as potential resources. Integrated water management is practised through a collaborative and jointly planned management of all water systems — where all waters are resources and are valued and put to use.
interception activity	An activity that intercepts **surface water** or **groundwater** that would otherwise flow, directly or indirectly, into a **waterway**, **aquifer** or storage
local management plan	A management plan developed by a **water corporation** for a local area, which describes the resource, management objectives and specific rules such as restrictions, **carryover** (if applicable) and trade in a specified area. Local management plans cannot amend licence conditions.
megalitre (ML)	One million (1,000,000) litres
Millennium Drought	The drought in Victoria that began with low rainfalls in late 1996 and ended in 2010, resulting in the lowest **inflows** on record into many of Victoria's **catchments**
Minister	The Minister for Water in Victoria, who administers the *Water Act 1989* (Vic)
passing flows	The minimum flows that an entitlement holder must allow to pass at a **weir** or **reservoir** before taking water for other purposes. Passing flow requirements are obligations on entitlement holders, who must report on compliance.
permissible consumptive volume	The total amount of water the **Minister** declares can be taken in a specified area or water system
potable	Water of suitable quality for drinking
quadruple-bottom-line method	A method of evaluating performance against four criteria: cultural, economic, environmental and social. It is an extension of triple-bottom-line accounting (people, planet and profit) to include cultural needs.
Ramsar wetland	A **wetland** of international importance and designated under the Ramsar Convention on Wetlands of International Importance (which was signed in 1971 in the Iranian town of Ramsar)
recreational users	People who use Victorian waters for fishing, waterskiing, rowing, camping, walking, birdwatching, sports events, social gatherings and other activities on or near **waterways**
recreational values	The objectives and benefits that **recreational users** and community members associate with the use of water, **reservoirs** and **waterways** for recreational activities. They include wellbeing and enjoyment derived from social interaction, physical activity and relaxation associated with activities such as sporting events, fishing, waterskiing and rowing, camping, walking and gathering with friends and family. These objectives and benefits also include flow-on economic benefits to local communities from visitors to regional areas.

recycled water	Water derived from **wastewater** that is treated to a standard appropriate for its intended use
Registered Aboriginal Party	A **Traditional Owner** group legally recognised under Victoria's *Aboriginal Heritage Act 2006*, with responsibilities for managing and protecting Aboriginal cultural heritage on **Country**. They are the primary guardians, keepers and knowledge holders of Aboriginal cultural heritage.
regulated system	A system in which the flow of the river is regulated by large dams or **weirs**
reservoir	A natural or artificial dam or lake used to store and regulate water
restorative justice approach to water	A return of rights that were never ceded, but were enjoyed by Settler communities and then enshrined in Western systems of law. It recognises that past practices have caused historical and continuing harm and inequities.
riparian	Land or vegetation adjoining a river, creek, estuary, wetland or lake
salinity	The total amount of water-soluble salts present in the soil or water
self-determination	The United Nations Declaration on the Rights of Indigenous Peoples describes self-determination as the ability for Indigenous people to freely determine their political status and pursue their economic, social and cultural equity, based on their own values and way of life. This means that **Traditional Owners** have the right to make choices that best reflect them on their journey to self-determination and self-governance.
sewage	Liquid waste produced by households and businesses
sewerage	The pipes and plants that collect, remove, treat and dispose of **sewage**
shared benefits	Benefits achieved when water is managed primarily to meet the needs of the entitlement holder, but also provides secondary environmental, **Traditional Owner** or social benefits through decision-making, without requiring additional water
small catchment dam	A small dam (usually on a farm) that stores water for irrigation or commerce, or for **domestic and stock** or aesthetic purposes. The use of a domestic and stock or personal aesthetic dam does not require a licence, unlike a commercial or irrigation dam.
sovereignty	The full power and political rights of a body or group over itself. Victorian **Traditional Owners** maintain that their sovereignty has never been ceded.
stormwater	Water run-off from urban areas. Urban development increases run-off because development increases surface areas that are impervious to water, such as roofs and roads.

streamflow management plan	A statutory management plan required for **water supply protection areas** under the Water Act. The plan defines specific rules to manage water resources of a priority unregulated **waterway** or **groundwater** resource that is under stress, or where there is demand for more development.
supply by agreement	An agreement between a water corporation and a person provided with an entitlement to water for a defined time period. Supply by agreement usually cover less reliable water sources, like drainage water, or areas where supply is not guaranteed.
surface water	Water found on the surface of the land, in **waterways** (such as rivers, **wetlands** and estuaries) and in bodies of water (such as lakes, dams and **reservoirs**)
surface water availability	Water in **waterways** or bodies of water that can be allocated under Victoria's water entitlement framework for **consumptive uses** or to the environment
Sustainable Water Strategy (SWS)	A long-term plan to secure the water future of Victoria's regions. The Strategy identifies and manages threats to the supply and quality of a region's water resources and identifies ways to improve **waterway** health. An SWS must also recognise Aboriginal cultural values and knowledge in water planning and management and include **Traditional Owners** in its processes, and also consider opportunities to provide water for economic, social and **recreational values**.
take-and-use licence	A fixed-term entitlement to take and use water from a **waterway**, run-off dam, spring, soak or **aquifer**. Take-and-use licences are typically held by diverters of unregulated waterways or **groundwater**. They can also be referred to as section 51 licences.
traditional ecological knowledge	Knowledge that incorporates the concept of biocultural diversity — the diversity of life in all its manifestations: biological, cultural and linguistic — which are interrelated (and possibly co-evolved) in a complex socio-ecological adaptive system. It is one of three types of Indigenous knowledge related to management of Country, the other two being knowledge of place, and contemporary conservation land management knowledge.
Traditional Owners	People who, through membership of a descent group or clan, are responsible for caring for particular **Country**. A Traditional Owner is authorised to speak for Country and its heritage.
Traditional Owner Corporation (TOC)	An incorporated group that represents the interests of **Traditional Owners** in a particular area. A TOC may hold rights under the *Native Title Act 1993* (Cwlth), the *Aboriginal Heritage Act 2006* (Vic) or the Traditional Owner Settlement Act 2010 (Vic) on behalf of the Traditional Owners it represents, and enter into other formal agreements.
treaty	An agreement between states, nations or governments. It can be an agreement between Indigenous peoples and governments. There is no set form for the contents of a treaty with Indigenous peoples. Each treaty is shaped by the history between the parties and the social and political context in which it is made. In Victoria, there could be one state-wide treaty or several treaties with individual Aboriginal groups.

unbundling / unbundled entitlement	A process by which an entitlement, previously called a water right (or a **take-and-use licence** in a **declared water system**), is converted into three separate entitlements: a **water share**, a delivery share or extraction share in a works licence; and a water-use licence.
unconfined aquifer	An aquifer whose upper **groundwater** surface — water table — is at atmospheric pressure (is in direct contact with the atmosphere)
unregulated system	A river system that does not have large dams or **weirs** to regulate flow
Urban Water Strategy	All urban water corporations in Victoria are required to develop an Urban Water Strategy, stating how water supplies and water demands will be balanced over the long term. These strategies are the next iteration of Water Supply Demand Strategies first prepared in 2007.
Victorian Environmental Water Holder (VEWH)	An independent statutory body responsible for holding and managing Victoria's environmental **water entitlements**
Victorian Water and Climate Initiative	A four-year research collaboration between the Victorian Government, Bureau of Meteorology, CSIRO and University of Melbourne into Victoria's changing climate and **hydrology**, and its water future. Findings from its first four years are presented in the report *Victoria's Water in a changing climate*. The Department of Environment, Land, Water and Planning is currently working with water industry stakeholders and research partners to design the next phase of the research program.
wastewater	Water that households and businesses wash away through the sewerage system
Water Act	*Water Act 1989* (Vic)
water balance	A summary of the flow of water into and out of a system, such as a **catchment** or town
water corporation	A government-owned organisation that provides a range of water services to customers in its service area, including water supply; sewage and trade waste disposal and treatment; water delivery for irrigation, domestic and stock purposes; drainage; and **salinity** mitigation. Some water corporations have regulatory functions for diverting water from **waterways** and extracting **groundwater**.
water entitlement	An authorisation to take and use water depending on resource **availability** — it could be a **water share**, **take-and-use licence**, water allowance or **supply by agreement**
water grid	Victoria's water grid connects sources of water through a network of natural and built infrastructure to meet demand for water by people, industries and the environment. It also incorporates arrangements by which water can be purchased and sold through **water markets** and allocated through the water entitlement framework.

water market	A market for the trade of water on a permanent or temporary basis under certain conditions
water quality	The chemical, physical, biological and radiological characteristics of water. It is a measure of the condition of water relative to the requirements of one or more biotic species or to any human need or purpose.
water recovery target	The volume of water to be recovered in a given flow-stressed system to maintain or improve specific environmental values
water sector	The broad range of entities with a stake or role in water management, for example **water corporations**, **catchment management authorities**, local government and the **Victorian environmental water holder**.
water security	The capacity of a population to access adequate quantities of acceptable-quality water to sustain life, socio-economic development and human wellbeing
water share	A continuing entitlement to a share of water in a **declared water system**. The volume of a share is the maximum amount of water that can be allocated for taking by the entitlement holder each year.
water storage	A hydrological feature that stores water. **Surface water** storages include natural and artificial ponds, lakes, **reservoirs** and lagoons, as well as **weirs** and dams.
water supply protection area	An area declared as such under the Water Act to protect **groundwater** or **surface water** resources through a groundwater management plan or **streamflow management plan**
waterway	A river, its associated estuaries and **floodplains** (including floodplain **wetlands**) and non-riverine wetlands
waterway health	The overall state of the main features and processes underpinning a functioning waterway **ecosystem** (such as species and communities, habitat, connectivity, **water quality**, **riparian** vegetation, physical form, and ecosystem processes such as nutrient cycling and carbon storage)
weir	A **barrier** across a river designed to alter flow characteristics
wetland	An area, whether natural, modified or artificial, that is subject to permanent or temporary inundation and holds static or very slow-moving water and develops — or has the potential to develop — biota adapted to the aquatic environment. A wetland may be fresh or saline.
winterfill licence	A licence that permits taking of water from a **waterway** during the winter months only (typically July–October)
yield	The quantity of water produced by a storage or **aquifer**

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Note: Website retrieval dates are current at June 2021.

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WSAA 2020, *All options on the table: Urban water supply options for Australia*, Water Services Association of Australia, **https://www.wsaa.asn.au/publication/all-options-table-lessons-journeys-others**

Image: Sale Common wetlands, Gunaikurnai Country

Appendix A: Interdependencies with other strategies and plans

The long-term plans set out in Sustainable Water Strategies complement and align with other plans, assessments, strategies and planning frameworks (**Figure A.1 Figure 3.6**).

Water for Victoria, the state's water plan, sets the long-term direction for managing Victoria's precious water resources. Since Water for Victoria was launched in August 2016, significant progress has been made in meeting the challenges of climate change and population growth, and taking action to ensure our water systems are modern and efficient, future-focused and affordable. The Central and Gippsland Region Sustainable Water Strategy will take further action to follow the directions set in Water for Victoria.

Urban Water Strategies identify the best mix of actions to provide water services to towns and cities now and into the future. Every five years, water corporations are required to develop Urban Water Strategies, in which they assess the risks to future water availability on a local scale, and develop options to meet future urban water demands based on detailed analyses of customer needs. Urban Water Strategies are currently being updated by each urban water corporation across Victoria for submission to the Minister for Water by March 2022. The Sustainable Water Strategy will set priorities for the region by determining how local and centralised supplies can operate together to provide for the future water needs and values of all Victorians.

A long-term water resource assessment, required every 15 years under the *Water Act 1989*, determines whether water availability has changed for farming, cities, towns and the environment. The assessment also determines whether there have been changes in waterway health, and informs the processes and decisions under the next relevant Sustainable Water Strategy. The *Long-term water resource assessment for Southern Victoria* was published in early 2020 (DELWP, 2020b). The Central and Gippsland Region Sustainable Water Strategy is required to consider the Long-Term Water Resource Assessment's findings and identify and then facilitate policies and actions that will sustainably share water resources (**see Appendix C**).

Each catchment management authority prepares a Regional Catchment Strategy in partnership with local communities and participants in integrated catchment management. The purpose of Regional Catchment Strategies is to identify, assess and manage regionally significant land, water and biodiversity resources, assets and landscapes. These strategies integrate and align community values and priorities for the region with those of the Sustainable Water Strategy, to create a long-term vision for our catchment resources. Regional Catchment Strategies are reviewed every six years.

The Victorian Waterway Management Strategy provides detailed policy for managing Victoria's waterways (Victorian Government, 2013). It aims to maintain or improve the condition of our waterways so they can support environmental, social, cultural and economic values that are important to communities. It provides direction for regional decision-making, investment and management of waterways, as well as specifying the roles and responsibilities of management agencies.

Each Regional Waterway Management Strategy is a single planning document for river, estuary and wetland management in a region over an eight-year period. These regional strategies all follow the management approach outlined in the Victorian Waterway Management Strategy.

Integrated water management forums are planning collaborations that consider all elements of the water cycle, including waterways and bays, wastewater management, potable and alternative water supplies, stormwater management and water treatment. Seven sub-regions, each with an Integrated Water Management Forum, have been established in the Central and Gippsland Region based on water corporation boundaries and Melbourne catchments. Each Integrated Water Management Forum develops a strategic directions statement of shared vision, objectives and prioritised opportunities for the sub-region. The Sustainable Water Strategy identifies ways to overcome barriers and facilitate integrated water management on a regional scale.

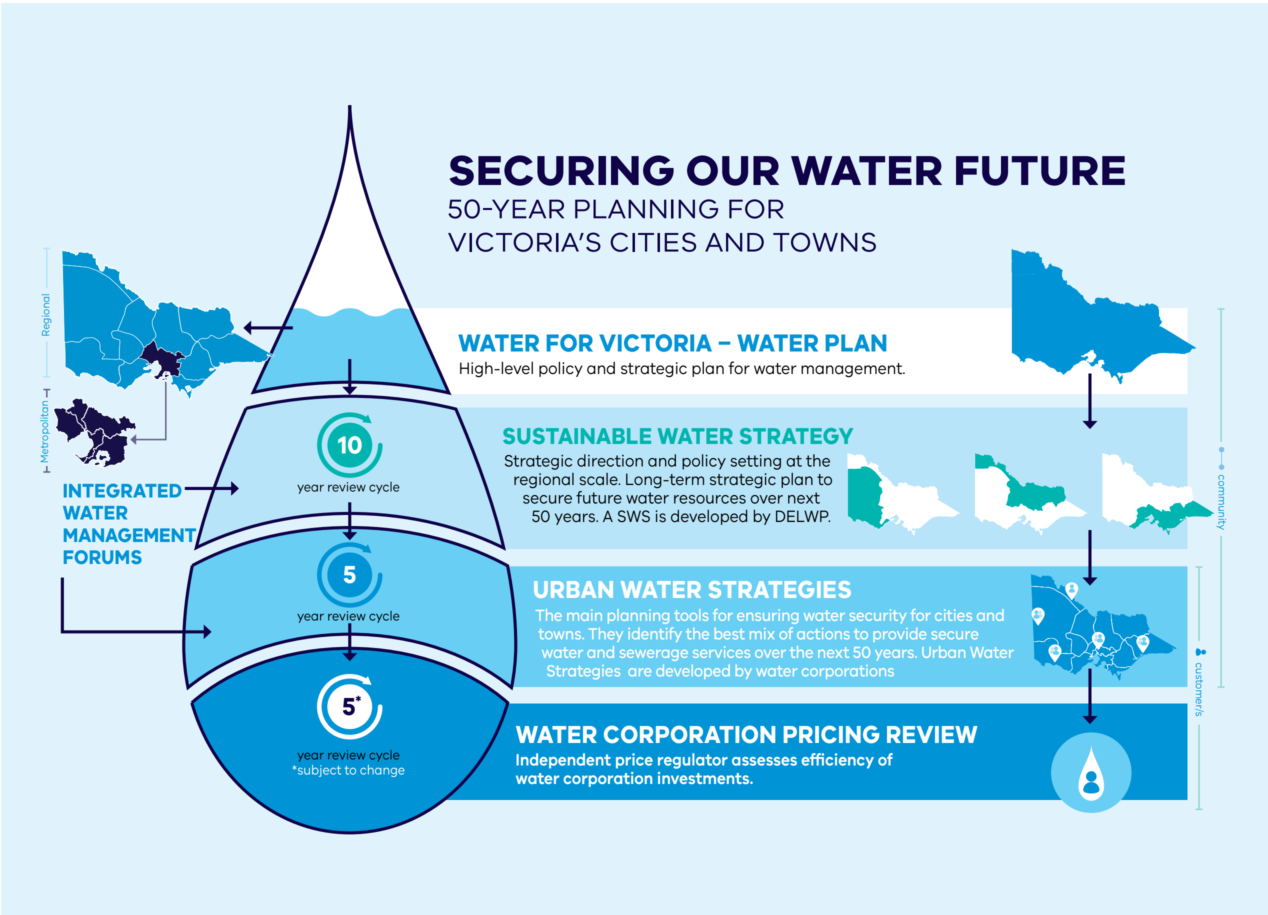


Figure A.1: Volumes needed to meet rebalancing requirements for the environment as determined by the Long-Term Water Resource Assessment and environmental water recovery targets within 5 and 10 years in each basin

Victoria's Climate Change Strategy was recently released and lays out a blueprint for action to help Victoria meet the challenges and act on the opportunities of climate change. State-wide Climate Change Adaptation Action Plans (AAPs) are currently being developed for seven different systems to prepare and respond to the current and future impacts of climate change. They are due for release in the coming months. AAPs are developed every five years for core systems, including health and human services, natural environment, built environment, water cycle, education and training, primary production, and transport. The Water Cycle Climate Change Adaptation Action Plan 2022-26 AAP will be Victoria's first legislated plan for the water cycle system. The Central and Gippsland Region Sustainable Water Strategy will compliment and align with the AAP and has been identified as an important vehicle to deliver on some of these actions. There is also alignment with some of the other AAPs and place-based adaptation strategies being developed across government and where relevant these linkages will be made clear in the final Central and Gippsland Region Sustainable Water Strategy. Feedback from consultation on aligned actions will be coordinated.

Table A.1:

Water Cycle Adaptation Plan Draft Action	Aligns with proposed Central and Gippsland Region Sustainable Water Strategy Action
Investigate ways to enable greater uptake of stormwater and recycled water	5-10 The Victorian Government proposes to provide incentives such as co-investing with councils, businesses, not for profit organisations and Traditional Owner corporations to use stormwater and recycled water to irrigate open spaces
	7-4 The Victorian Government proposes to work with local authorities to build community confidence in increasing the safe and suitable use of recycled water and stormwater.
	7-7 The Victorian Government proposes to investigate the viability of a citywide alternative water network, to increase the supply of stormwater and recycled water for non-drinking uses.
	7-8 The Victorian Government proposes to clarify stormwater licensing (and caps on extraction) for assets forming part of a stormwater management system.
	7-10 The Victorian Government proposes to clarify the rights of local councils to use stormwater on their own land (for example sporting fields) and to arrange the supply of or access to stormwater in local council assets.

Water Cycle Adaptation Plan Draft Action	Aligns with proposed Central and Gippsland Region Sustainable Water Strategy Action
Investigate ways to enable greater uptake of stormwater and recycled water	7-13 The Victorian Government proposes to: – embed IWM objectives in major urban developments and infrastructure projects, to ensure that all sources of water, including stormwater and recycled water, are used in the landscape – require the use of IWM plans for land-use decisions on future developments and suburbs – explore ways to include IWM criteria in planning guidance material and policies
	9-2 The Victorian Government proposes to develop additional guidance for public investment in specific types of projects, such as stormwater and recycled water infrastructure, as required
	11-3 The Victorian Government proposes to quantify current and future agricultural demand for water in Melbourne's green wedges and peri-urban areas, and provide information on potential sources of water, including stormwater and recycled water.
	12-4 The Victorian Government proposes to progress a review of the institutional, legislative and regulatory arrangements for managing stormwater as a resource in the Lower Barwon.
Investigate augmentation options to secure water supplies for greater Melbourne and surrounds	6-1 The Victorian Government proposes to work with water corporations, catchment management authorities and Traditional Owners across the region to develop a Water Supply Readiness Roadmap (to be published in the final Strategy and regularly updated). • The Roadmap will identify preferred near-term water supply options based on a quadruple-bottom-line analysis, clarify the roles and responsibilities of the various parties for decision-making and implementation, and articulate the triggers for readiness, selection and implementation. • Assessing the potential of each option to return water to the environment and Traditional Owners will be an essential stage of the assessment process.
	7-2 The Victorian Government proposes to investigate options to ensure that the region's desalination capacity meets future needs.
	7-7 The Victorian Government proposes to investigate the viability of a citywide alternative water network, to increase the supply of stormwater and recycled water for non-drinking uses.
	10-6 The Victorian Government proposes to secure Warragul and Drouin's urban water supply by increasing Gippsland Water's access to water from Tarago Reservoir.
	10-7 The Victorian Government will continue to support integrated water management forums and projects within the Gippsland region to support water security issues and help deliver more liveable regional cities and towns.

Water Cycle Adaptation Plan Draft Action	Aligns with proposed Central and Gippsland Region Sustainable Water Strategy Action
Investigate augmentation options to secure water supplies for greater Melbourne and surrounds	12-1 The Victorian Government proposes a small increase to Barwon Water's share of water from the Melbourne supply system, and upgrades to the Melbourne-to-Geelong Pipeline within five years, to make better use of the water grid and provide greater water security for Geelong. This would also allow water to be returned to the Moorabool River, the most flow-stressed river in the state, and its Traditional Owners, the Wadawurrung.
	12-2 The Victorian Government proposes to implement the integrated water management plan for the northern and western Geelong growth areas, to help build the sub-region's water resource resilience.
	12-3 The Victorian Government proposes to continue to implement the IWM Plan for Ballarat, to help build the sub-region's water resource resilience.
Review existing rainwater tank and water efficiency building and plumbing requirements	5-2 The Victorian Government proposes to work with the Commonwealth and the other states and territories to strengthen Water Efficiency Labelling and Standards ratings and minimum standards as part of the current review.
	5-3 The Victorian Government proposes to inform future decisions and prepare regulatory impact statements on the costs and benefits of:introducing higher water efficiency requirements for homes • improving and extending the current rainwater tank requirement for new homes to a broader range of developments.

Appendix B: Consultative committee and independent panel

Consultative committee

The Minister for Water appointed a consultative committee of regional stakeholders to guide and oversee the Strategy's development. The consultative committee met five times between February 2021 and June 2021; its deliberations provided regional perspectives on the Strategy's development. Preparation of the final Strategy will be guided by the consultative committee and will incorporate feedback from the community.

The consultative committee is chaired by Christine Forster. Appointed members include representatives of Registered Aboriginal Parties, urban and rural water corporations, catchment management authorities in the Central and Gippsland Region, the Victorian Environmental Water Holder, and the Department of Jobs, Precincts and Regions (**Table B.1**). The Eastern Maar Aboriginal Corporation was also invited to join the consultative committee but decided to participate in waterway management and planning through other processes at this time.

Table B.1: Consultative committee members who helped develop the Strategy

Independent chair	Christine Forster AM
Traditional Owner Corporations	
Bunurong Land Council Aboriginal Corporation	Dr Rohan Henry
Gunaikurnai Land and Waters Aboriginal Corporation	Lisa Hocking
Wadawurrung Traditional Owners Aboriginal Corporation	Michael Cook
Wurundjeri Woi-wurrung Cultural Heritage Aboriginal Corporation	Jordan Smith and Karmen Jobling
Water corporations	
Barwon Water	Tracey Slatter
Central Highlands Water	Jeff Haydon
Western Water	Jeff Rigby
City West Water	Maree Lang
Yarra Valley Water	Tiffany White
South East Water	Lara Olsen

Melbourne Water	Nerina Di Lorenzo
South Gippsland Water	Phillippe du Plessis
Westernport Water	Peter Quigley
Gippsland Water	Sarah Cumming
East Gippsland Water	Lara Caplygin
Southern Rural Water	Cameron Fitzgerald
Wannon Water	Andrew Jeffers
Catchment management authorities and Victorian Environmental Water Holder	
Corangamite Catchment Management Authority	Helen Watts
West Gippsland Catchment Management Authority	Eleisha Keogh
East Gippsland Catchment Management Authority	Bec Hemming
Port Phillip and Westernport Catchment Management Authority	David Buntine
Victorian Environment Water Holder	Paulo Lay
Government departments	
Department of Jobs, Precincts and Regions	Beth Jones

Independent panel

The Minister for Water appointed an independent panel for the Central and Gippsland Region Sustainable Water Strategy. It is important to seek independent review and advice on the Strategy, given the significance of this work. The panel will consider comments made on the draft Strategy during public consultation, and will report its findings (which may include recommendations) to the Minister to consider before finalisation of the Strategy.

The independent panel is chaired by Sally Farrier. The appointed panel members are:

- Dr Rohan Henry
- Rob Spence
- Joan Liley.

Appendix C: Response to the findings of the Long-Term Water Resource Assessment for Southern Victoria

C.1 Long-term water resource assessments

Water in Victoria is limited. For this reason, under the Water Act the Minister for Water manages the sharing of surface water and groundwater between users.

Water sharing arrangements need to be kept up to date. A long-term water resource assessment is a formal process for considering whether:

- a long-term reduction in water availability needs to be shared more equitably between consumptive users and the environment
- water sharing arrangements need to respond to a deterioration in waterway health due to change in flow.

If a long-term water resource assessment shows that a review of water sharing arrangements is needed, this may be done as part of the review or as part of developing a new Sustainable Water Strategy.

Long-term water resource assessments have not considered whether there has been a reduction in the volume of water available in entitlements for Traditional Owners, because until recently Traditional Owners have not held water entitlements. As water is returned to Traditional Owners, future long-term water resource assessments will also need to consider the effects of any declines in water availability on entitlements held by Traditional Owners.

The Water Act requires preparation of a long-term water resource assessment every 15 years.

Assessment in southern Victoria

The first Long-Term Water Resource Assessment for Southern Victoria was completed in 2020, by the Department of Environment, Land, Water and Planning in collaboration with Southern Victoria's water corporations and catchment management authorities.

The draft technical assessment report was made available for public consultation and review by the Environment Protection Authority in late 2019. The Environment Protection Authority checked whether the data used was the best available and whether the conclusions reached were supported by the methodology and the data. The Environment Protection Authority endorsed the methodology and conclusions of the assessment.

Feedback on the draft assessment from the Environment Protection Authority and the community was incorporated into the report before it was finalised in 2020.

Findings in southern Victoria

The Long-Term Water Resource Assessment found that long-term surface water availability across southern Victoria has declined by up to 21 per cent. Current long-term surface water availability is less than when it was last estimated for the previous Sustainable Water Strategies.

In many areas, this has meant less water for consumptive uses (by people and industry) and for environmental flows to protect the health of our waterways. Water availability for consumptive uses has declined in most of southern Victoria by between 1 and 13 per cent. In all basins except the Otway Coast, water availability for the environment has declined by between 4 and 28 per cent.

The Victorian Government anticipated drying conditions and has worked closely with water corporations and catchment management authorities to manage the state's water accordingly. This Strategy continues the planning for, and adaptation to, drying conditions.

The Long-Term Water Resource Assessment found that the decline in water availability has not always been shared equally, and the declines have fallen disproportionately on the environment in some basins (Latrobe, Thomson, Yarra, Maribyrnong, Werribee, Moorabool and Barwon). A smaller share of available water is now set aside for the environment than when the last Sustainable Water Strategies were developed. The environment's proportion would have declined even more had water for the environment not been recovered, such as by creating new environmental entitlements.

Long-term groundwater availability has declined in some areas of southern Victoria, although this has had little effect on consumptive uses. Similarly, groundwater extraction has had only a very small effect on water availability for the environment at the regional level compared with other influences, such as climate change.

The Long-Term Water Resource Assessment did not clearly identify an overall deterioration in waterway health for reasons related to flow, due to a lack of available data; unfortunately, waterway health has not been monitored with consistent methods for the decades necessary to identify long-term trends.

Based on the findings of the Long-Term Water Resource Assessment, the Minister determined that a review of water sharing arrangements is required for seven river basins (Barwon, Moorabool, Werribee, Maribyrnong, Yarra, Latrobe and Thomson), and that opportunities to restore the balance in how our water is shared will be explored through this Strategy, as part of broader planning. Like all Strategy processes, the response to the Long-Term Water Resource Assessment must have regard to relevant economic and environmental matters, together with Traditional Owner cultural values and uses of waterways (including economic), and social and recreational values.

Responding to the findings of the Long-Term Water Resource Assessment

The Strategy is a long-term plan for securing a sustainable supply of water in the region, and proposes to improve the environmental values and health of water ecosystems for the benefit of all users. Rather than focusing on rebalancing water sharing alone, the Strategy aims to find the best solution to improve the health of waterways. Actions such as installing a fishway or protecting water quality do not increase the volume of water available to the environment, but may considerably improve waterway health. In some cases, these types of solutions offer greater environmental benefit and perform better under a broad range of climate scenarios, because they are more resilient to dry conditions and require less water.

The response to the Long-Term Water Resource Assessment has been aligned with existing processes for recovery and management of water for the environment. The draft Strategy proposes water recovery targets for each major river system in the basins where there is an environmental water deficit. The proposed targets cover the minimum volumes needed for critical flows and to ensure the survival of species, but do not include the larger volumes needed to meet all environmental needs (see **Section 3.4**). Water recovery volumes are linked to specific values and the needs of those values, and are based on best available knowledge.

The Strategy proposes a range of actions to meet these water recovery targets, including using recycled water and stormwater — either for consumptive use and creating new water supplies so that more water can remain in the rivers for environmental purposes, or directly as an environmental flow where the recycled water quality is suitable and releases can be timed to mimic the required flow conditions. Actions for each river basin are set out in **Chapters 10** to **12**.

Table C.1 compares the proposed environmental water recovery targets with the volume of water required in each river basin to restore the environment's share to when the last sustainable water strategies were developed — that is, to return the proportional sharing of water to what it was under historical climate conditions and operations at the time of the last Sustainable Water Strategy.

Directions proposed in the draft Strategy will contribute towards the rebalancing of water between uses in five of the seven river basins under review, and will improve the health of all river basins through targeted water recovery and complementary measures. In some cases, a return to the historical share of water entitlements between consumptive and environmental users is not necessary to meet a given river system's environmental values.

The draft Strategy is not proposing to recover the 53 gigalitres per year identified in the Long-Term Water Resource Assessment for the Yarra Basin, or the 23 gigalitres per year identified for the Latrobe Basin to restore the historical water sharing balance in the near term. This is because the best available data show that 53 gigalitres per year is not required to achieve the environmental objectives agreed in the 2018 Healthy Waterways Strategy (for the Yarra River), and for the Latrobe River the priority water recovery target during the life of this draft Strategy (10 years) is 4.4 gigalitres per year.

Environmental water recovery targets in the next 10 years exceed the rebalancing volume in the Thomson, Maribyrnong and Werribee basins. In the Barwon and Moorabool basins, the rebalancing volume sits within the range of the proposed environmental water recovery targets. Options to achieve these targets will be assessed using a quadruple-bottom-line assessment.

Table C.1: Volumes needed to meet rebalancing requirements for the environment as determined by the Long-Term Water Resource Assessment and environmental water recovery targets within 5 and 10 years in each basin

Basin	Volume for rebalancing	Environmental water recovery targets within 5 and 10 years (GL/yr)
Thomson	7	8–15
Macalister		6–12.6
Latrobe#	23	1.5–4.4
Yarra	53	10–34
Maribyrnong	1	2.5–7
Werribee	5	11.8 (10 years)
Barwon/Leigh	4	2.3–5
Moorabool	4	2.6– 6.5

Does not include flow recommendations for the estuaries of lower Latrobe wetlands.

Appendix D: A variable and drying climate

A variable, drying climate and the possibility of future disruptive events combine to form a complex situation with uncertainties at several levels. Management strategies cannot rely on predictive planning based on past conditions and decisions. Social, political and scientific responses, feedbacks and tipping points of systems are yet to be fully understood and accurately represented in modelling. This section shows the trends of a variable and drying climate, the associated disruptive events and their effects.

A variable climate

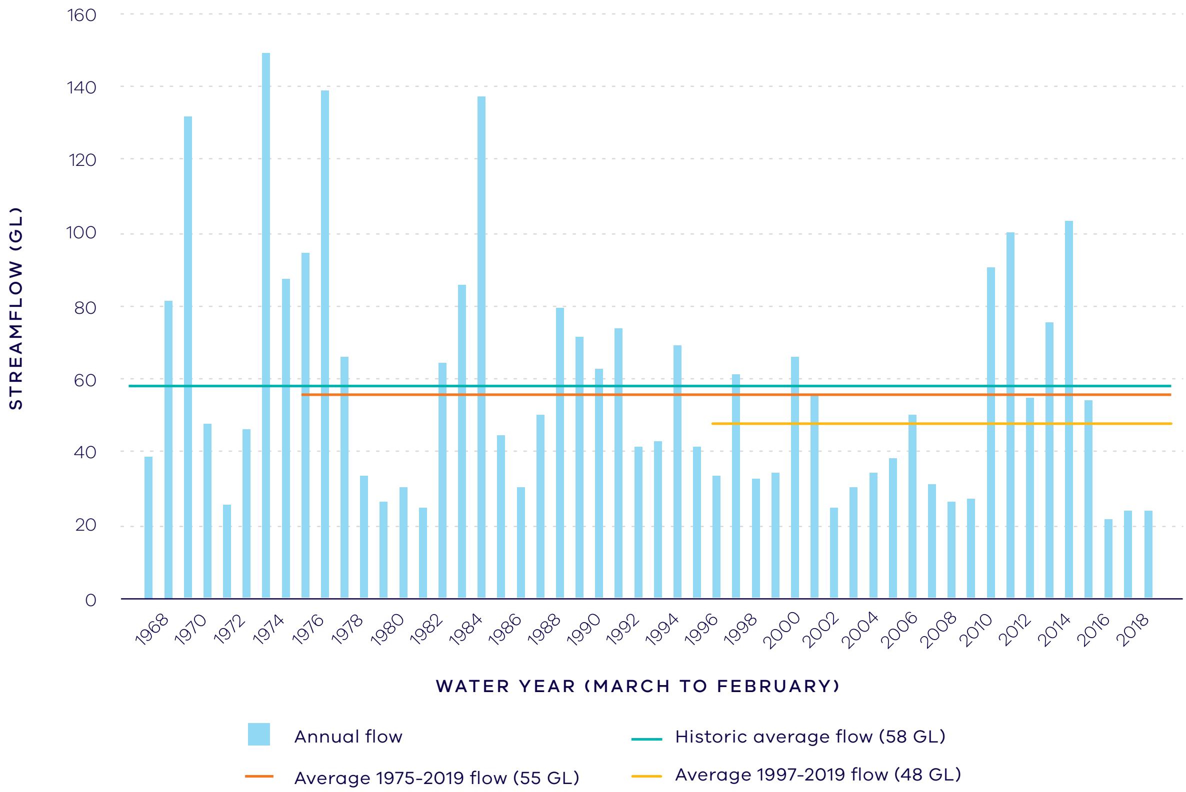
As in other parts of southern Australia, climate in the Central and Gippsland Region is highly variable and will continue to be so into the future.

Figure D.1 shows the hydrologic record of streamflow at four sites in the Central and Gippsland Region, including periods of above-average and below-average run-off. These variations are often linked to cyclic climatic influences, such as the El Niño–Southern Oscillation and the Indian Ocean Dipole.

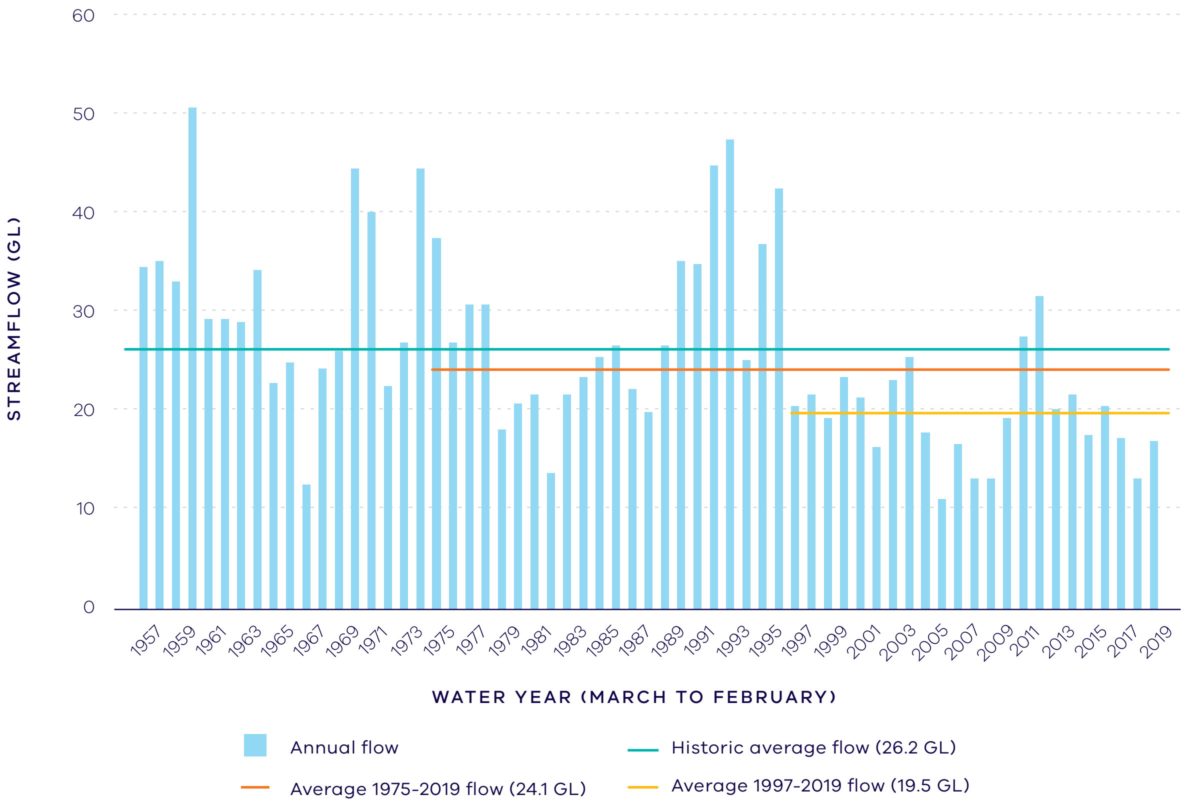
The Victorian floods of 2010–11 and the recent dry years in Gippsland are clear examples of the climate variability linked to these natural cycles. The floods of 2010–11, which affected large portions of Victoria, were driven by 'record warm sea surface temperatures to the north of Australia and one of the strongest La Niña events ever observed in the Pacific Ocean' (BOM, 2011, p. 4). At the other end of the scale, below-average rainfall in recent years in East Gippsland and New South Wales coincided with 'a strong positive phase of the Indian Ocean Dipole in 2019, which is typically associated with dry conditions in many parts of Australia' (BOM, 2019b, p. 4).

The incidence of past floods and droughts was also influenced by underlying climate change. Although global warming is already affecting Victoria's climate, the large variability inherent in the observed climate record makes it difficult to determine the extent to which individual events in the recent record can be attributed to climate change.

Errinundra River at Errinundra



Loch River at Noojee



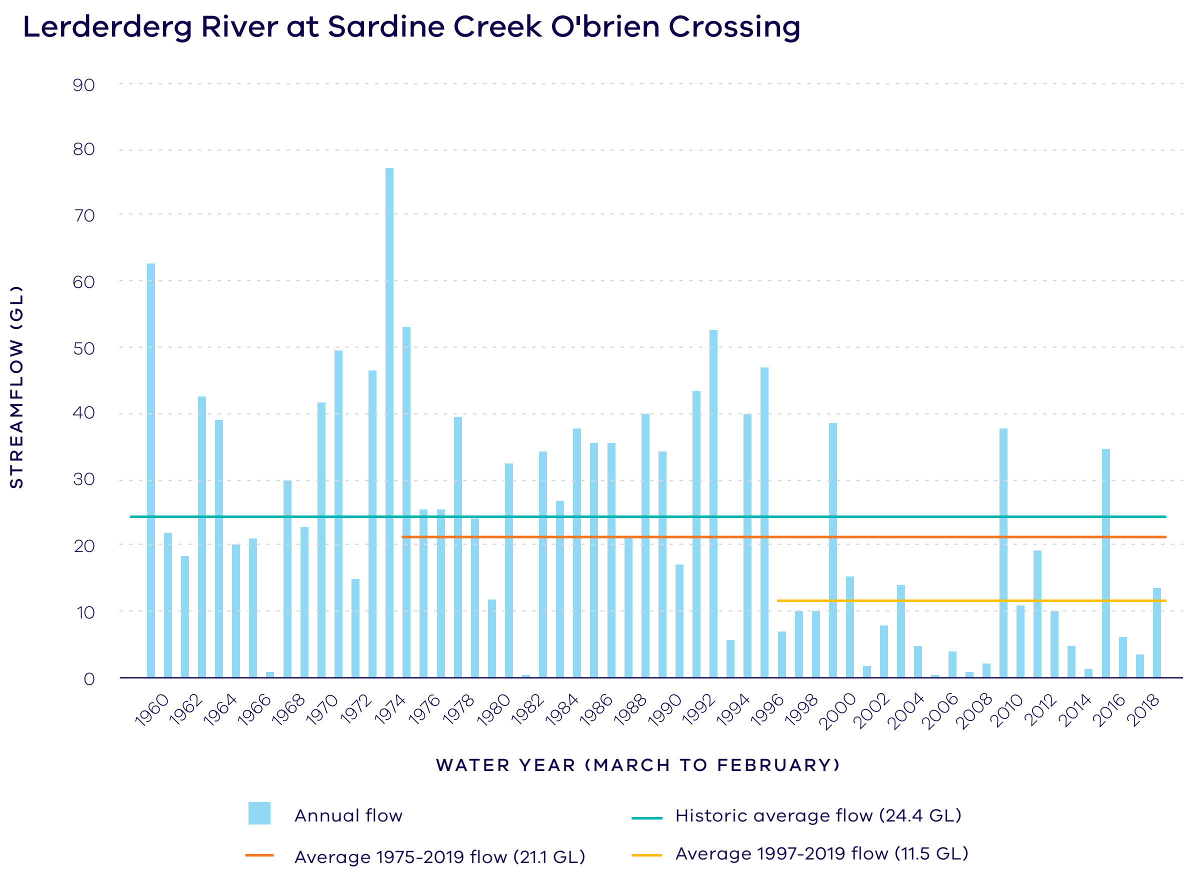


Image: Dights Falls on the Yarra River, Abbotsford, Wurundjeri Woi-wurrung Country

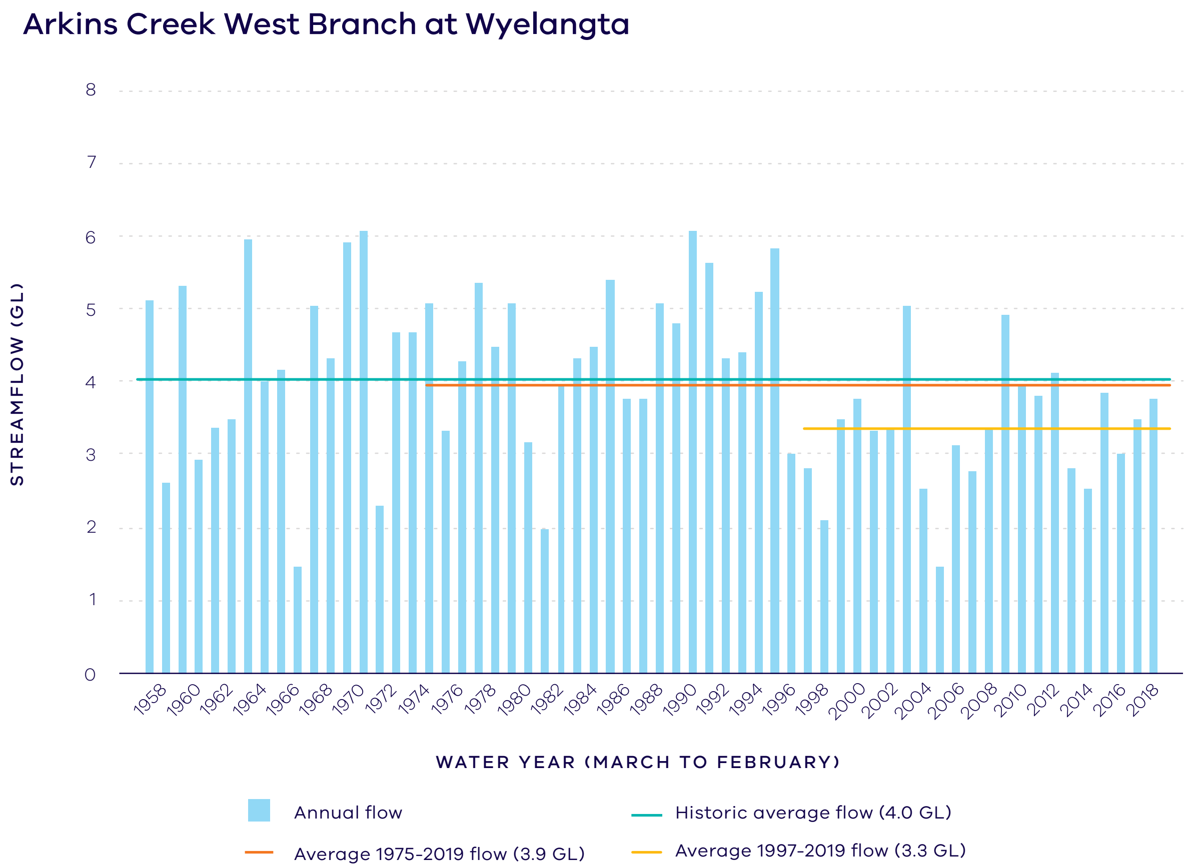


Figure D.1: **Recorded streamflow at four hydrologic reference stations in the Central and Gippsland Region, demonstrating variability from year to year, with periods of above-average and below-average streamflow**

Current declines in water availability

Victoria's climate is highly variable. However, the overall trend in recent decades has been towards warmer and drier conditions. Since the pre-industrial period, global temperatures have increased by approximately 1.1 °C. In Australia, 2019 was the hottest year on record (BOM, 2020).

During the Millennium Drought (1997–2009), rainfalls in the cool season (April–October) were the lowest on record when averaged across Victoria. They have continued to be low across the state and, in many locations for the 23 years since 1997, have been lower than in any other 23-year period on record. Indeed, average cool-season rainfalls across Victoria from the beginning of the Millennium Drought in 1997 to the end of 2018 were approximately 12 per cent below the 1900–1959 average (Rauniyar & Power, 2020). This relative decline is significant, because in the past rainfalls in the cool season have provided most of the run-off to Victoria's rivers, filling water storages and providing environmental flows.

Reductions in rainfall are magnified in streamflows. Typically, a given reduction in rainfall will result in a twofold to threefold reduction in catchment run-off. Water availability has been further affected by an observed reduction in rainfall run-off during and after the Millennium Drought in some Victorian catchments — that is, the amount of run-off resulting from a given amount of rainfall has declined in some catchments (DELWP et al., 2020).

Current estimates of surface water availability (based on the post-1975 climate period) are lower than when it was last estimated for the Sustainable Water Strategies (DELWP, 2020b) using the long-term climate record. Declines in water availability range from 5 per cent of the river flow in the Latrobe Basin to 20 per cent of river flow in the Moorabool Basin (**Figure 2.5** in **Section 2.2**). Declines are largest in the

Werribee, Maribyrnong, Moorabool and Yarra basins.

The current estimate of surface water availability was based on the post-1975 period because the records from this period are more representative of the climate today than are those of earlier periods. Although we considered using a more recent period, we chose post-1975 to ensure adequate representation of long-term changes in climate rather than shorter-term fluctuations in weather. The influence of climate change can be expected to be greater in more recent periods, and it is possible that the much drier conditions since 1997 also reflect a permanent shift in our climate and water availability.

Although we know that climate change is playing a role in Victoria's climate and water resource position today, there is uncertainty about how much it has influenced the dry conditions since 1997. It is possible that the reductions in rainfall and water availability we are already experiencing are significantly greater than those shown in **Figure 2.5** in **Section 2.2**, which were based on the post-1975 period.

Future declines in water availability

The Victorian Government is working to better understand the effects of climate change on water availability across the state. Because rainfall is the greatest single factor influencing water availability, much of this research has focused on understanding how rainfall is affected by climate change.

The past few decades have been Victoria's warmest period on record, coupled with declining rainfalls in the cool season (Hope et al., 2017). This decline in rainfall is associated with an increase in the number of high-pressure systems over southern Australia and a decrease in rainfall from cold fronts and low-pressure systems (DELWP et al., 2020).

Most global climate models indicate that climate change has contributed to declines in rainfall in south-eastern Australia (Rauniyar & Power, 2020). Therefore, while rainfall will continue to vary from year to year, the underlying downward trend in cool-season rainfalls due to climate change is projected to intensify unless global greenhouse gas emissions are markedly reduced.

Moreover, based on our past observations of the Victorian climate and our understanding of future greenhouse gas emissions, over the long term we can expect:

- increases in summer rainfall
- increases in potential evapotranspiration due to higher temperatures and lower relative humidity
- reductions in streamflow because of less rainfall overall and higher evapotranspiration
- a general decline in streamflow response to rainfall.

Increases in summer rainfall are unlikely to offset the effect on streamflow of reduced winter rainfall, because most run-off in Victorian catchments occurs over winter and spring. In the warmer months, catchments are drier, so more rainfall soaks into the ground, is used by vegetation, or evaporates.

Although much variability in Victoria's climate and streamflow will continue, the chances of experiencing warmer conditions and less streamflow are now higher than in past decades.

While our understanding of the potential effects of climate change on future water availability will continue to advance, we need to prepare now for a range of future climate conditions. This Strategy considers several possible future climate scenarios and proposes policies and actions to deal with climate uncertainty. Preparing for such scenarios allows potential risks to water supplies, in a range of possible future climates, to be considered in the long-term planning of Victoria's water resources.

The potential effects of each future climate scenario on the streamflow of the region's river basins has been modelled. Historic inflows have been calculated using best available data through water resource models and gauged streamflow records. Inflows for two historical climate reference periods have been presented: post-1975 and post-1997.

The scenarios for high, medium and low climate change are based on climate projections derived from 42 global climate models. These are used by scientists to model the potential consequences of different scenarios — including scenarios of greenhouse gas emissions and concentrations over time — on the Earth's atmosphere, oceans and land. The medium climate change scenario represents the median (50th percentile) rainfall response from the 42 global climate model projections, and the low and high scenarios represent the wetter (10th percentile) and drier (90th percentile) rainfall responses respectively from the 42 global climate model projections.

Figure D.2 shows that, assuming little curbing of greenhouse gas emissions (see the box below about representative concentration pathways), streamflows throughout the region are projected to be about 8–22 per cent lower than those for the historical reference period (1975–2018)[46] under a medium climate change scenario in 2065. Under the high climate change scenario, reductions in streamflow are projected to be highest in the Western and Central basins — the same basins that are already experiencing the greatest declines in water availability, except for the Otway Basin. These basins include the Yarra, Maribyrnong, Werribee, Moorabool and Barwon, with up to 44–55 per cent reductions projected for 2065. The remaining basins in the east of the region and the Otway Basin are projected to undergo smaller reductions, generally between 36 and 42 per cent, under the high climate change scenario (Potter et al., 2016).

All projections are relative to the post-1975 historical climate reference period.

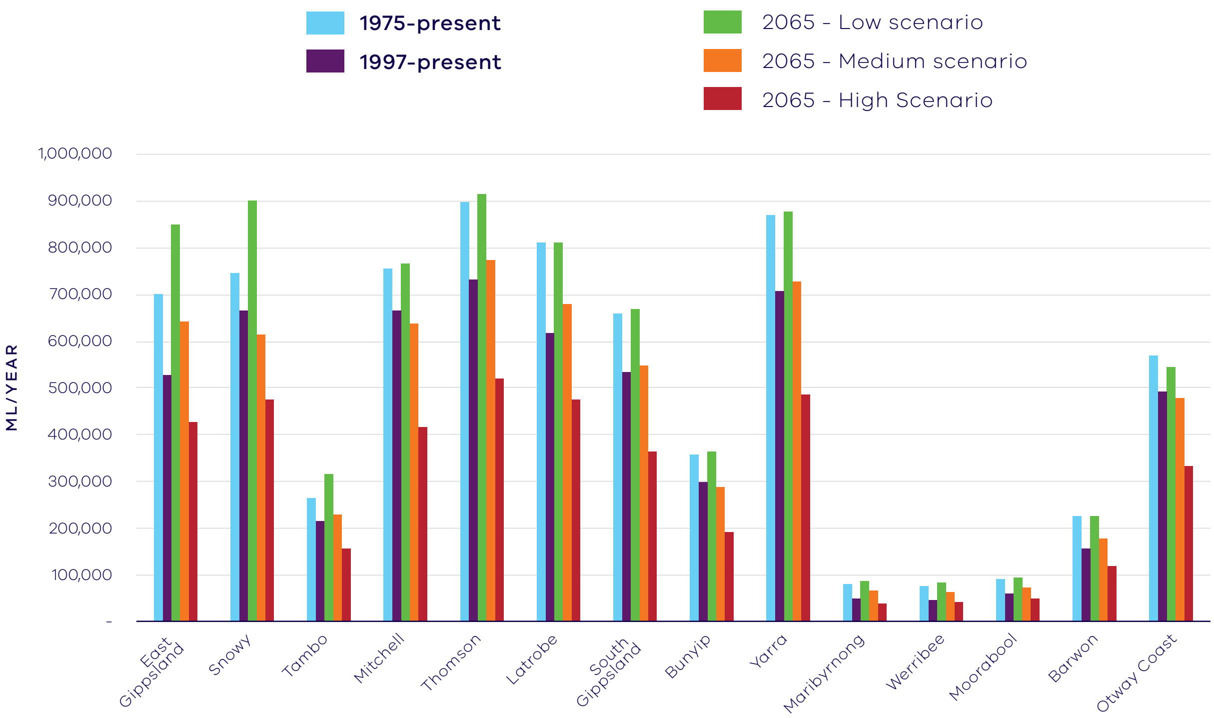


Figure D.2: Water availability projections for low, medium and high climate change scenarios for 2065, assuming little curbing of greenhouse gas emissions (RCP8.5), compared to average annual inflows for two historical reference periods (1975–present and 1997–present)

46 The historical reference period does not include 2019 and 2020 because data for these years are yet to be finalised and published.

Representative concentration pathways

What are representative concentration pathways?

In climate modelling, representative concentration pathways (RCPs) are scenarios of future greenhouse gas emissions and concentrations over time. The scenarios also include other changes, such as the recovery of the Antarctic ozone hole and reductions of aerosol emissions from industry. The RCPs are expressed as radiative forcing values in the year 2100. For example, the highest emission scenario of RCP8.5 is a radiative forcing in the year 2100 of 8.5 watts per square metre. Global climate models are used to model the response of the Earth's climate system to the different RCPs.

Figure D.3 illustrates how Victorian temperatures could track under the RCP8.5 scenario, and with the lower RCP2.6 scenario, which is broadly consistent with the goals of the Paris Agreement to hold the increase in global average temperature to well below 2 °C above pre-industrial levels and also pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels (UNFCCC, 2016).

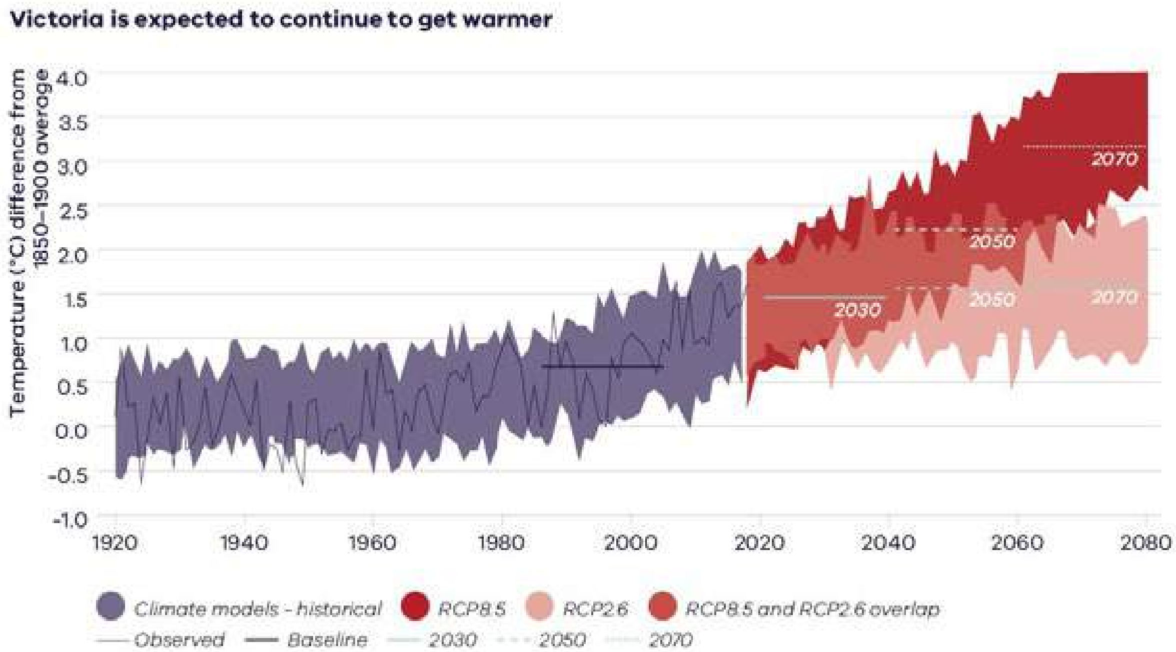


Figure D.3: Average annual temperature of Victoria in observations and models relative to the pre-industrial era, showing the highest emissions pathway (RCP8.5) and the lowest (RCP2.6) separately

What projections are used in the Central and Gippsland Region Sustainable Water Strategy?

The rainfall and streamflow climate change projections used in this Strategy are taken from Potter et al. (2016), which are based on the outputs from an ensemble of 42 global climate models referenced in the Intergovernmental Panel on Climate Change's Fifth Assessment Report (IPCC, 2014). The Strategy's projections are based on the RCP8.5 scenario, with the low, medium and high scenario representing the 10th, 50th and 90th percentile outcome from the 42 available global climate models.

Why use RCP8.5 for short-term planning?

For some years now, global greenhouse gas concentrations and emissions have been tracking along the higher of the RCP scenarios. Over the near term, different RCPs do not result in substantially different temperature projections (and hence rainfall and run-off projections) due to the lag in response between global greenhouse gas concentrations and the global temperature response.

In practice, observations of Victoria's surface air temperature and cool-season (April–November) rainfall since the mid-1990s have both tracked along the warmest and driest global climate model projections (DELWP, 2019b). Most global climate models underestimate the magnitude of the observed declines in rainfall, which suggests that global climate model projections may also underestimate the effects of increasing greenhouse gas concentrations on rainfall declines in Victoria (DELWP, 2019b).

Image: Connewarre marsh lands, South Geelong, Wadawurrung Country

Why use RCP8.5 for long-term planning?

Future global greenhouse gas emissions and concentrations are uncertain, so it is unclear which of the RCP pathways the world will ultimately experience. There has been a recent slowdown in emissions growth, and pledges by the world's governments to reduce greenhouse gas emissions, meaning that lower and moderate emissions scenarios are also plausible (such as RCP4.5 or RCP6.0).

Figure D.4 shows surface water availability in the Central and Gippsland Region under projected climate change assuming the (high) RCP8.5 scenario and the (moderate) RCP4.5 scenario.

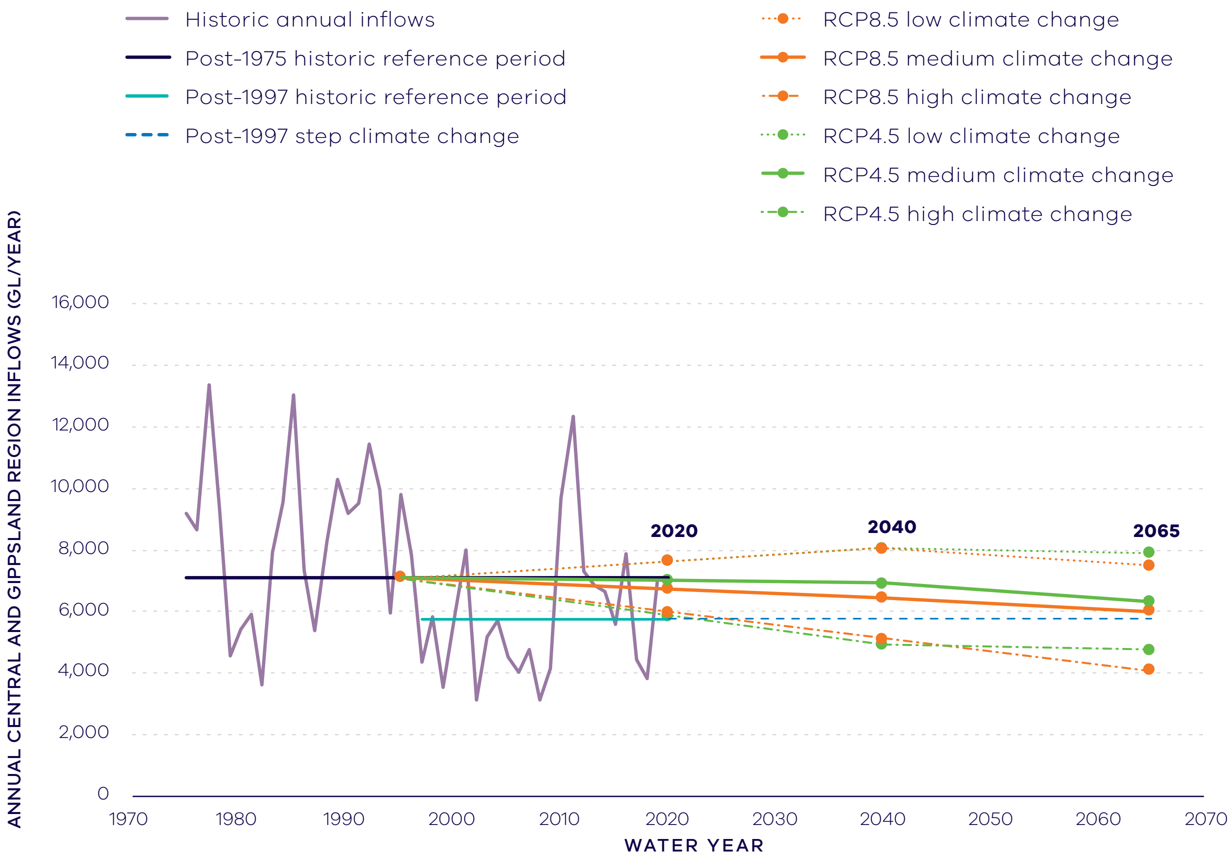


Figure D.4: Projected surface water availability in the basins of the Central and Gippsland Region under the RCP4.5 and RCP8.5 representative concentration pathway scenarios

Over the long term, the RCP8.5 scenario generates the driest 90th percentile (high) climate change projection for Victoria, and therefore covers a broad range of outcomes, including a future that is drier than the post-1997 historical reference period. The only outcome that is not covered by the RCP8.5 scenario, but which is covered by the RCP4.5 scenario, is that of a slightly wetter future under the 10th percentile (low) climate change scenario. Although such an outcome is plausible, many lines of evidence suggest that Victoria is more likely to experience a future that is both hotter and drier than in the past.

The RCP8.5 scenario is used in this Strategy because it enables robust planning. It allows Strategy options to be tested under a range of plausible scenarios, from a wetter future to one of severe drying. This method allows for global climate modelling uncertainty, and uncertainty around future greenhouse gas emissions and concentrations.

Guidelines for assessing the impact of climate change on water availability in Victoria

Planning for future climate variability and climate change is important for water resource planners because most of Victoria's water sources are climate dependent.

Victoria's water sector has a strong track record in evidence-based and consistent methods of planning for climate change.

The Victorian Water and Climate Change Initiative has issued guidelines for assessing the impact of climate change on water availability in Victoria (DELWP, 2020a). These guidelines provide a range of plausible climate change projections for consideration when planning for the sustainability of Victorian water resources. They also provide information on changes to climate variability associated with climate change, system vulnerability, sensitivity and stress-testing.

The guidelines are updated periodically to reflect the latest scientific discoveries and knowledge on climate, lessons from previous application of the guidelines, and changes to relevant policy and legislation.

The most recent edition of the guidelines was released in 2020 and can be found at **www.water.vic.gov.au/climate-change/adaptation/guidelines**.

Image: 2 people walking across paddocks, Wadawurrung Country

Image: Bass River, Bass, Bunurong Country

Appendix E: Available river water

Table E.1: River water available across the basins of the Central and Gippsland Region, and its use

Basin[1]	Total river water available (ML/yr)	Cities and towns[2] (ML/yr)	Rural use[2] (ML/yr)	Licensed farm dams[2] (ML/yr)
East Gippsland	747,329	498	631	93
Snowy	770,733	170	4,088	407
Tambo	277,923	223	3,802	216
Mitchell	777,733	4,082	9,375	959
Thomson	914,072	142,062	208,454	889
Latrobe	829,757	72,652	23,751	1,868
South Gippsland	661,577	7,568	5,693	4,636
Bunyip	360,358	25,753	8,324	3,336
Yarra	884,890	372,646	53,411	–
Maribyrnong	85,678	2,704	1,907	652
Werribee	77,790	3,887	24,855	169
Moorabool	92,100	26,997	1,633	1,960
Barwon	234,766	25,182	3,559	2,775
Otways Coast	563,755	17,042	2,424	3,586

1. Estimates are based on the post-1975 climate reference period and on operations as at 2017. The exceptions are Maribyrnong, Werribee, Moorabool anc
2. These estimates assume full use of entitlements.
3. Water that is not categorised includes run-of-river losses and unallocated water that cannot be reasonably considered for consumptive uses or the env
4. The negative volume reported for the Bunyip Basin represents return flows from the Bunyip Main Race.

Power generation (ML/yr)	Environ-mental entitlement (ML/yr)	Above-cap water (ML/yr)	Water for Traditional Owners (ML/yr)	Not categorised[3] (ML/yr)
–	–	744,689		1,351
–	–	765,876		–
–	–	272,002		1,415
–	–	757,264	2,000	4,053
–	32,776	519,765		12,559
97,205	13,627	605,341		17,058
–	–	639,515		4,120
–	2,299	323,286		–2,641[4]
–	17,004	405,463		36,367
–	–	78,289		2,127
–	941	37,636		10,302
–	1,748	50,295		9,466
–	1,279	186,640		15,331
–	–	539,091		3,334

l Barwon basins, which are based on the post-1975 climate reference period and on operations as at 2020.

vironment. It also includes unallocated water available for new winterfill licences.

Appendix F: Water entitlement framework

F.1 Victorian water entitlement framework

The volume of water authorised to be taken in Victoria is either specified in a water entitlement or allowed for under a statutory right. The Victorian water entitlement framework is designed to ensure that individual entitlements to water are explicit, enforceable and, in appropriate circumstances, tradeable.

All water entitlements are recorded in the Victorian Water Register, which provides an authoritative record of the entitlement volumes and associated transactions, including allocations and trade. Useful information for water users about water entitlements and related arrangements can be found on the Victorian Water Register website.

Entitlement holders are responsible for managing their own water needs as well as the risks of any water scarcity.

Existing entitlements are protected by the statutory framework, which caps the amount of water that can be taken and makes it an offence to take water without authorisation. It also supports water access by allowing users to trade entitlements and allocations, which gives them flexibility to meet their individual water needs.

F.2 Water rights and entitlements

The Water Act provides rights to water for domestic and stock use and Traditional Owner use, and water entitlements for both consumptive and environmental purposes. Consumptive uses include urban drinking water supply, irrigation, industrial uses and power generation. Environmental uses include delivery of water to important environmental sites such as wetlands, and water flowing in waterways.

Authorised forms of take are set out in the Act and outlined below.

Statutory rights — sections 8 and 8A

Sections 8 and 8A of the Water Act provide for statutory rights to take water without the need to obtain further authorisation from the Minister. These rights allow a person to take and use water in certain circumstances and under certain provisions of the Water Act.

Domestic and stock rights, also known as section 8 rights, provide the right under specified circumstances for a person to take water for their personal household use and for raising stock.

Section 8A of the Water Act provides that any member of a Traditional Owner group who has a natural resource agreement containing the relevant conditions under the *Traditional Owner Settlement Act 2010* (Vic) may take and use water from a waterway or bore for traditional purposes. In this context, 'traditional purposes' means providing for the personal, domestic or non-commercial communal needs of the group members. This agreement does not currently apply to any Traditional Owner groups in the region covered by the Central and Gippsland Region Sustainable Water Strategy.

Bulk entitlements

Under the Water Act, the Minister for Water may make an order granting a bulk entitlement to allow the holder to take a volume of water subject to conditions specified in the bulk entitlement. A bulk entitlement does not have a specified term or period and is therefore a continuing entitlement.

A bulk entitlement may only be held by a water corporation, the Minister administering the

Conservation, Forests and Lands Act 1987 (Vic), a generation (power) company within the meaning of the *Electricity Industry Act 2000 (Vic)*, or the Victorian Environmental Water Holder.

In regulated systems, 'source' bulk entitlements give the right to harvest water and the obligation to deliver water to primary entitlement holders (water shareholders, other bulk entitlement holders and the Victorian Environmental Water Holder).

Environmental entitlements

The Minister for Water may, by instrument, allocate water under an environmental entitlement to the Victorian Environmental Water Holder. The purposes of such environmental entitlements are to:

- contribute to the Environmental Water Reserve
- improve the environmental values and health of water ecosystems, including their biodiversity, ecological function and water quality
- assist other uses that depend on good or improved environmental condition.

Environmental entitlements and bulk entitlements can be amended and traded.

Water shares

A water share is a legally recognised and continuing entitlement to a share of the water available in a declared water system. The volume of water that may be taken in any year will depend on the allocation in relation to a water share, and any carryover that applies. Water shares can be high- or low-reliability. The reliability relates to the level of security and how allocations are made in relation to water shares.

Decisions about allocations are based on a range of factors, particularly the amount of water available in the system and future estimated inflows. Allocations are made against high-reliability water shares before low-reliability water shares.

Delivery shares or extraction shares (delivery determination under section 222 of the Water Act) provide access to water, particularly during times of less water availability. A delivery share is an entitlement to have water delivered to land in an irrigation area. It gives the holder access to a share of the available capacity in the channel or piped network that supplies water to their property.

A water-use licence or water-use registration is an entitlement to irrigate a specific parcel of land. Water-use licences allow the holder to apply irrigation water to land, while water-use registrations are for any other purpose.

A works licence authorises the construction, alteration, operation, removal or decommissioning of any works on a waterway. The licence may specify when works may be used, and impose other restrictions or conditions, including those that protect the environment and third parties.

Take-and-use licences

A take-and-use licence, also known as a section 51 licence, is an entitlement issued for a fixed term to take and use surface water or groundwater from a specified source: a waterway, catchment dam, spring, soak or aquifer. Take-and-use licences authorise access to water from undeclared surface water and groundwater aquifers.

The maximum licence term is 15 years — or 30 years for power generation companies — but can be renewed. Take-and-use licences can be transferred (traded) permanently or temporarily.

Registration licence

A registration licence authorises the taking and using of water from a dam, spring or soak. Registration licences were issued between 1 July 2002 and 30 June 2003 and recognised historical water use. A registration licence is perpetual and does not attract a licence fee. It is attached to land and therefore cannot be traded, except with the sale of the land, but may be converted to a take-and-use licence if the holder wants to trade.

Urban water supply

Individuals who are supplied by urban water corporations are not required to obtain an entitlement or exercise a right under the Water Act to take water for use in their homes. Urban reticulated water supply is managed by water corporations. A water corporation in a particular water district must supply water to the owners of all serviced properties in that district. The water to meet this obligation is sourced from the urban water corporation's bulk entitlement, or from water shares that it owns.

A water corporation may decide to enter into contractual arrangements — known as a supply by agreement — to supply water to customers where, for example, there are properties that are not designated as serviced properties.[47] These may specify a range of matters including the volume of water, flow rates, quality, period of time and the purpose for which the water will be used. The water supplied under a supply by agreement is sourced from the water corporation's bulk entitlement or water share or take-and-use licences.

Water corporations may also supply recycled water and stormwater, through their reticulated water supply infrastructure or through supply by agreement with individual customers.

F.3 Environmental Water Reserve

The Water Act provides a strong foundation for considering and mitigating the environmental consequences of taking and using water from a system, and those of the construction of works related to the taking and using of water.

The Water Act establishes the Environmental Water Reserve in Victoria. The Environmental Water Reserve objective is to preserve the environmental values and health of water ecosystems, including their biodiversity, ecological function, quality of water and other uses that depend on environmental condition. The Victorian Environmental Water Holder must use its water holdings consistent with the Environmental Water Reserve objective.

Environmental water in the Environmental Water Reserve is provided in three ways:

- *environmental water entitlements* — a volume of water held by the environment in perpetuity. In general, the entitlements are a share of the available resource (inflows) in storages that can be released to meet specific environmental needs
- *obligations on consumptive entitlements (passing flows)* — the volume of water that water corporations or licensed diverters are obliged to provide out of storage or past a diversion point before water can be taken for consumptive use
- *'above-cap' water* — the water available above limits on consumptive use of surface water and groundwater, as well as unregulated flows that cannot be kept in storage. Most (90 per cent) of the water available to the environment is 'above-cap', which can be a very unreliable source of water.

The Victorian Environmental Water Holder holds environmental entitlements and bulk entitlements in eight river basins in southern Victoria.

47 Serviced properties (section 144) and water districts (Part 6A, section 122GA) are declared under the Water Act.

Image: Sale Common wetlands, Gunaikurnai Country

Further information

A number of Victorian Government strategies, plans and technical reports have been utilised to develop the discussion draft Strategy, ensure policy alignment and build upon existing efforts that are occurring across the water sector in the Central and Gippsland region. The links below provide additional information.

Additional technical information will also be made available on the Department's website. The information can be found at **https://www.water.vic.gov.au/planning-and-entitlements/long-term-assessments-and-strategies/sws/central-gipps-sws**.

Strategy/plan or technical supporting information referred to in the draft Strategy	Link to further information
Barwon River Action Plan	**https://www.water.vic.gov.au/waterways-and-catchments/barwon**
Integrated Water Management Framework for Victoria	**https://www.water.vic.gov.au/liveable/integrated-water-management-program/iwm-framework**
Long Term Water Resource Assessment for Southern Victoria	**https://www.water.vic.gov.au/planning/long-term-assessments-and-strategies/ltwra**
Latrobe Valley Regional Rehabilitation Strategy	**https://earthresources.vic.gov.au/projects/lvrrs**
Southern Victorian Irrigation Development Project	**http://www.srw.com.au/projects/svid-irrigation-study**
State Environment Planning Policy (Waters)	**https://www.water.vic.gov.au/waterways-and-catchments/rivers-estuaries-and-waterways/state-environment-protection-policy**
Victoria's Water Availability Climate Change Guidelines	**https://www.water.vic.gov.au/climate-change/adaptation/guidelines**
Urban Water Strategies	**https://www.water.vic.gov.au/liveable/urban-water-strategies**

Strategy/plan or technical supporting information referred to in the draft Strategy	Link to further information
Victoria's Climate Change Adaptation Plan 2017–2020	**https://www.climatechange.vic.gov.au/__data/assets/pdf_file/0024/60729/Victorias-Climate-Change-Adaptation-Plan-2017-2020.pdf**
Victoria's Climate Change Adaptation Resources	**https://www.climatechange.vic.gov.au/climate-change-adaptation-resources**
Victoria's Water Grid Dashboard	**https://www.water.vic.gov.au/water-grid-and-markets/the-grid**
Victorian Waterway Management Strategy	**https://www.water.vic.gov.au/waterways-and-catchments/rivers-estuaries-and-waterways/strategies-and-planning**
Waterways of the West Ministerial Advisory Committee (development of the Waterways of the West Action Plan)	**https://www.water.vic.gov.au/waterways-and-catchments/wow**

Image: Farm dam on rural property in Elaine, Wadawurrung Country

Image: Barwon Rivers meets the Leigh River, Inverleigh, Wadawurrung Country delwp.vic.gov.au