WATER FOR GOOD

A plan to ensure our water future to 2050

Government of South Australia

Water for Good

Water is our most valuable resource. It's fundamental to our health, our way of life, our economy and our environment.

Our growing population and reduced rainfall means South Australians think more about water than ever before. We are not only more aware of water issues, we are also placing greater value on water and instinctively taking action to save it.

Water is vital for the preservation of both quality of life and the environment for all South Australians. It also underpins growth in population and the economy – and these are critical to the State's future prosperity.

Water for Good is a plan that ensures there will always be enough water in South Australia. Most importantly, it will enable us to diversify our supplies to reduce our reliance on the River Murray and other rain-dependent water sources.

Acknowledgements

The Office for Water Security would like to acknowledge the support provided by the Project Steering Group, Interagency Advisory Committee and the many others who have contributed to the development of **Water for Good**.

The Hon Mike Rann MP
Premier of South Australia
Minister for Sustainability and
Climate Change

Water is undeniably our most precious resource.

South Australia continues to experience unprecedented dry weather patterns, and the impact of climate change is becoming increasingly apparent.

As a result, our communities have adopted a range of water-saving measures that have significantly reduced consumption, and we lead the nation in stormwater capture and re-use, irrigation practices, wastewater recycling and rainwater tank ownership.

Water for Good builds on these important initiatives, and outlines a comprehensive strategy to ensure our State has the most secure water supply in southern Australia.

That includes doubling the capacity of the Adelaide Desalination Plant, securing our access to upstream water storage facilities, and investing further in innovative stormwater harvesting and wastewater recycling projects.

It provides a blueprint for improved, sustainable water practices in all aspects of our lives – in cities and regions, for domestic, commercial and agricultural use – and allows us to further develop water sources that are not dependent on rainfall.

By placing even greater value on our existing water resources and finding new and effective ways to protect and supplement them, South Australia will continue to lead the nation in water supply innovation.

Water for Good provides certainty for the future of our most prized resource, and reassurance that South Australia's water supply will continue to support our economy, our lifestyle and our environment.

The Hon Karlene Maywald MP
Minister for the River Murray
Minister for Water Security

The State Government's top priority is ensuring that all South Australians have sufficient water supplies for a sustainable lifestyle, economy and environment for good.

And this goal will be achieved through developing a diverse range of water supplies.

Extreme drought in the Murray-Darling Basin and the Mt Lofty Ranges has meant we can no longer use water as we have in the past – we need to be more efficient and much wiser when using our most precious resource.

The actions outlined in **Water for Good** will reduce our reliance on the River Murray and other rain-dependent water sources. Through this prudent forward-planning, we will be well-placed to meet the needs of a growing population and business community, particularly in times of drought.

In future, our water supplies will feature climate-independent water through desalination. This ensures a portion of our water needs is guaranteed, despite increasing climate variability expected in future.

We already lead the nation on stormwater and wastewater recycling projects and we will continue with more of these projects to reduce the draw on our potable supplies.

Across regional South Australia, local communities will play a key role in developing water supply and demand plans that account for future growth and local supply issues.

Water for Good provides greater emphasis on water conservation, transparent decision-making and independent scrutiny of service delivery and pricing. New legislation will be enacted to better reflect the needs of a modern, more competitive and diverse water industry.

Water for Good ensures we will be well placed to meet new challenges and manage future demands for water right through until 2050 - for generations of South Australians to come.

Robyn McLeod
Commissioner for Water Security

Water for Good is a robust multidimensional plan to ensure water security for South Australia into the future.

Sustainable water sources underpin economic growth, the health of our environment and our quality of life.

Changing rainfall patterns mean in future we must no longer rely on the River Murray or even our reservoirs or aquifers for our total water sources.

Diversity and innovation in our water products is critical as we move to more non rain-dependent water sources.

Desalination will represent a significant part of our water future, as will opportunities to recycle stormwater and wastewater for non-potable uses.

To provide this security, water will have to become more expensive to reflect its true value.

This 21st century water industry must be managed by best practice legislation and independent regulatory regimes.

And innovation in future augmentation options should be encouraged through adaptive regional planning, competition, market development and third party access regimes.

But most importantly, our citizens need to continue to value water and use it wisely.

Best practice models and the most up-to-date thinking in Australia have been brought together to develop **Water for Good** and I thank the many people from the water industry, academia, government and the private sector who have contributed to its development.

Constant review and adaptability will be necessary to ensure we stay on track.

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Water Volumes

Throughout this document it has been necessary to refer to water volumes using various units of measurement, depending on the context. A summary of these is given below:

How much water is that?

Kilolitre (kL)
One kilolitre is 1000 litres. Kilolitres are the units most commonly used in referring to household water use, with the average Adelaide household using between 200-250 kL each year when we are not on water restrictions.

Megalitre (ML)
One megalitre is 1000 kL or one million litres and is roughly the volume of most 50 metre public swimming pools. The Torrens Lake between Hackney Road and the Torrens Lake weir holds about 600 ML.

Gigalitre (GL)
One gigalitre is 1000 ML or 1 billion litres and represents a volume of water one square kilometre by one metre deep. When full, the Hope Valley reservoir holds about 2.8 GL and the Happy Valley reservoir holds 11.6 GL.

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Water for Good outlines the actions we need to take to ensure our water supplies are secure, safe, reliable and able to sustain continued growth.

Part 1
The plan in summary

Part 1
The plan in summary

Introduction

Water is vital for the preservation of both quality of life and the environment for all South Australians. It also underpins growth in population and the economy – and these are critical to the State's future economic prosperity.

Water for Good outlines the actions we will take to ensure our water supplies are secure, safe, reliable – and able to sustain continued growth – for at least the next 40 years.

The measures in this Plan focus on how we will secure our water supplies. How we allocate our water to different needs for example, consumptive or environmental uses, is clearly the responsibility of Natural Resources Management Boards. Leaders in agriculture and other water intensive industries also play an important role through industry planning.

The future of the River Murray is substantially dependent on the sustainable management of the Murray-Darling Basin particularly in upstream states. South Australia will continue to pursue a sustainable future for the river through the newly established Murray-Darling Basin Authority. To better manage the Basin in the national interest, the Authority is developing a basin-wide plan, to be completed by 2011, that will include new sustainable caps on surface and groundwater for all river catchments. A healthy River Murray will sustain our environment, our communities and our irrigation industries in the future.

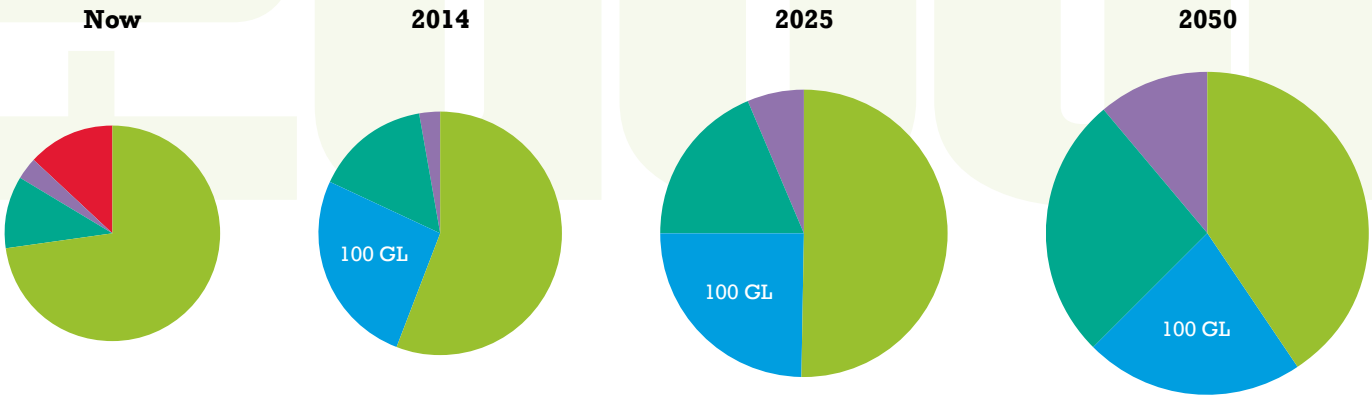
Water for Good aims to provide our State with the most secure water supply system in southern Australia. Greater Adelaide will not need water restrictions – beyond permanent water conservation measures – more than once in every 100 years.

Most importantly, it will enable us to diversify our supplies to reduce our reliance on the River Murray and other rain-dependent water sources.

Restoring the health of the River Murray will still be crucial as it will continue to be an important source of water to supply regional cities and towns and irrigation industries. A healthy River Murray is also essential for a healthy environment and as a back up to Adelaide supplies.

Water for Good actions will apply throughout the State, and a vital component of the Plan will be the development – with community involvement – of detailed water demand and supply plans for every region. This will ensure that long-term solutions

Figure 1
Greater Adelaide's water supply from all sources for both drinking and non-drinking purposes



are based on a thorough understanding of the state of local resources, the demand for them, and likely future pressures. These regional plans will sit side-by-side with **Water for Good** and support and inform its delivery in the short, medium and long terms.

In the years to come, the true value of water will become fundamental to how we think about – and use – this precious resource. We will all be more careful in many different ways.

South Australians can be confident that we will have enough water to enjoy our quality of life, and support our economy and the environment.

Our climate in context

Like much of the south of the continent, South Australia is experiencing unprecedented dry weather patterns – drier than at any other time in our recorded history. This is most likely the result of climate change.

Lower rainfall over an extended period has had the compounding effect of reducing flows into storages, rivers, watercourses and groundwater. Flows into the River Murray have been at their lowest since records began, 118 years ago.

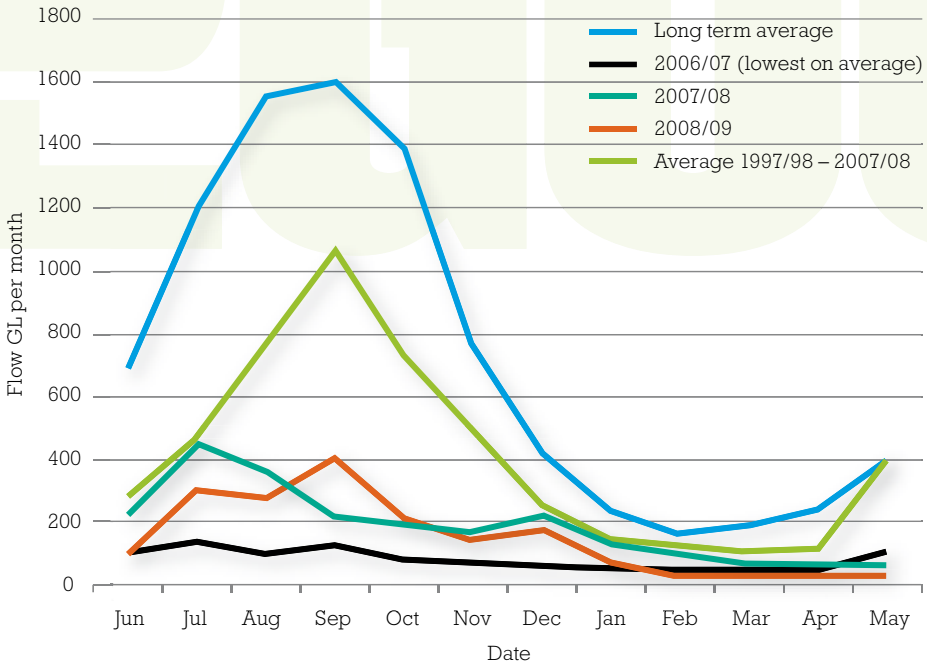
We have seen significantly less rain and run-off in the Mount Lofty Ranges catchment area, which feeds our reservoirs. Our groundwater supplies – water contained in the aquifers and basins beneath the surface – are also showing signs of stress.

South Australia has traditionally relied on the River Murray for much of its water but that resource is under threat, not only because there has been less rain but because of a history of over-allocation and over-use.

The combination of these factors is having a devastating effect on River Murray irrigation industries and many communities, particularly those along the length of the river, and those around the Lower Lakes and the Coorong. The impact on Lake Alexandrina, Lake Albert and many other highly valued environments has been serious and prolonged. In cities and regional areas around the State, people are being required to accommodate water restrictions, and many home gardens and community open spaces are showing the effects.

There are very strong indications that significant parts of southern Australia are experiencing a changing climate and that we can expect these

Figure 2
River Murray System Inflows (excluding Menindee and Snowy)



less reliable rain patterns to continue. According to the CSIRO, we can anticipate an overall decline in rainfall of between 15% and 30%, and, as a consequence, a reduction in run-off into our storages. In some years, however, we might still experience heavy falls and even flooding. Some experts are referring to this phenomenon as a 'step-change' in climate.

We can no longer assume that the recent change in rainfall patterns is a temporary situation – that the drought will end, and the rains we have relied on in the past will return.

Managing our water supply in a variable climate requires adaptive and innovative solutions. We must continue to work to modernise and improve the water practices of the past – in our cities and towns, in agriculture, commerce and industry – and rethink how we manage the water industry.

We will continue to encourage everyone who lives, works in and visits South Australia to treat water as a precious commodity and to use it more wisely. We will plan and build, in a timely manner, for new and diverse water sources that are not dependent on rain.

The challenge for us all is to successfully navigate through the current difficult situation while remaining focused on our longer-term goals – securing, protecting and diversifying our water sources, and improving our supply infrastructure, so that we are well placed to face the challenges the future may bring.

That is what **Water for Good** is about – providing certainty about our water future and instilling confidence that we will have what we need to support our economy, sustainability and prosperity. It is about putting the necessary foundations in place so we can act quickly to manage the ramifications of both greater climate variability, and climate change.

The importance of growth

South Australia's population is forecast to reach two million by 2027, 23 years earlier than the target set in the original *South Australian Strategic Plan* of 2004. Strong and well-managed population growth is a key driver of prosperity and good economic performance. A growing, diverse population feeds the labour market to support expanding and changing industries.

In its March 2009 *Economic Statement*, the South Australian Economic Development Board considers South Australia's prospects for economic growth over the next decade to be bright and, compared with the national economy, better than they have been for many decades.

Major new mining developments, our growing defence sector and an emerging opportunity to establish South Australia as a national leader in renewable energy technology will sustain investment for decades to come, with benefits continuing to flow from the agricultural, manufacturing and services sectors.

However, the Board highlights water scarcity as a key issue that must continue to be addressed for the State to fully capture emerging economic opportunities, secure a genuine social dividend, and become more environmentally sustainable.

Recent responses

Much has already been achieved in recent years to improve water conservation and management.

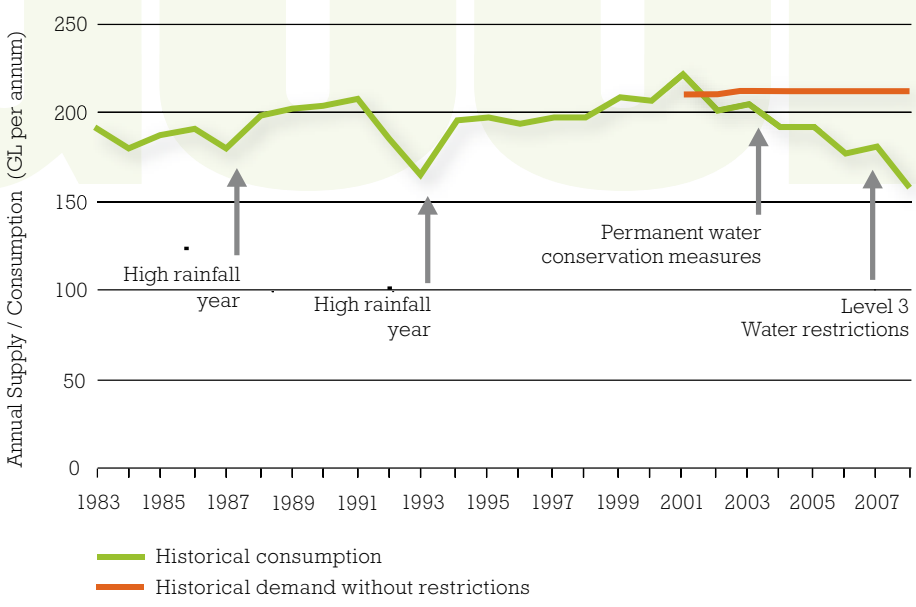
South Australians lead the country in stormwater capture and reuse, irrigation practices, rainwater tank ownership and wastewater recycling. With the enactment of the *Natural Resources Management Act 2004*, South Australia undertook major reform in the protection of natural water resources through an integrated approach to natural resource planning, water allocation and management.

Communities across the State have embraced the challenge to use water more wisely. Since 2003, the people of Greater Adelaide have cut their water use by approximately 25%. A range of water saving measures has been introduced since the State Government's *Water Proofing Adelaide Strategy* was released in 2005 and these, combined with water restrictions, have been instrumental in encouraging water-sensitive behaviours and practices.

However, like other water strategies developed by governments across south-eastern Australia in the past decade, *Water Proofing Adelaide* was released before the full extent of the drought – and what we now recognise as a longer-term drying phenomenon and climate change – was understood. It has become clear that we can – and must – do much more to reduce consumption and diversify our water sources.

To supplement our existing Mount Lofty Ranges storages, South Australia has successfully negotiated access to storage in the Hume and Dartmouth dams in the upper reaches of the River Murray. This

Figure 3
Water consumption changes for Greater Adelaide



extends the volume of water we can store for critical human needs from 12 months capacity to more than two-and-a-half years capacity. Storage access has also been secured for private irrigators so they can carry over any unused portion of their water allocation from one year to the next.

An independent Commissioner for Water Security, the first in Australia, was appointed in 2008 and is giving greater focus to planning and implementation, co-ordinating and integrating policy, and further educating the community.

The 2009-10 State Budget provides $2.1 billion over four years to secure South Australia's water supply.

In 2007, the State Government announced the decision to build a 50 gigalitre (GL) desalination plant. Work is underway on this world-class facility and it is expected to produce first water by December 2010.

Further, in May 2009, the Government announced that, with the support of Commonwealth Government funding, the capacity of the Adelaide Desalination Plant will be doubled and be able to provide 100 GL a year of desalinated water by the end of 2012.

While a range of water supply options were considered before proceeding with this significant infrastructure project, no other non rain-dependent options could provide a response to match the rapidly drying climate we are experiencing.

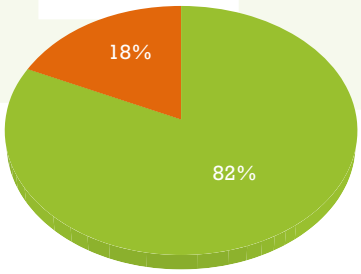
Our likely water future

Many possible scenarios could be used for forecasting South Australia's future water needs. For the purposes of this Plan, we have chosen the most prudent. It assesses what our water situation would be, in any given year between now and 2050, taking the following factors into account:

- State population to reach 2.49 million by 2050, including about two million in Greater Adelaide
- climate change variability and impacts based on the fourth assessment report of the Intergovernmental Panel on Climate Change (specifically A2 and B2 climate change scenarios)
- existing minimum entitlement (for drought conditions) from the River Murray of 897 GL a year
- inflows to the Mount Lofty Ranges reservoirs of 35 GL a year
- a 41% reduction over the next 40 years in inflows to the Mount Lofty Ranges reservoirs, as a result of climate change
- economic growth projections developed by the South Australian Economic Development Board.

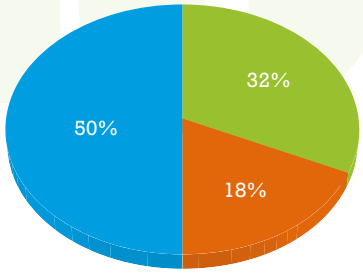
Figure 4

Now
Mix to supply 200 GL of drinking water in a dry year



Now
- River Murray
- Reservoirs
- Desalination

End of 2012
Mix to supply 200 GL of drinking water in a dry year



2012
- River Murray
- Reservoirs
- Desalination

Major reforms

Water for Good provides more than 90 deliverable actions to diversify our water sources, improve water conservation and efficiency, and improve and modernise our water industry.

- A key action for the short term is the doubling of the capacity of the Adelaide Desalination Plant – a joint State-Commonwealth Government project costing $1.83 billion, with $328 million contributed by the Commonwealth Government
- Into the future, we will further reduce our reliance on rain-dependent sources such as the River Murray and the Mount Lofty Ranges reservoirs by increasing stormwater harvesting and wastewater reuse. Recycled water in various forms has valuable uses, particularly in agriculture, horticulture and some areas of industry. However, it must be fit for the intended purpose and pose no risks to the environment, or to public health and safety
- The Murray-Darling Basin Authority will deliver its plan for the sustainable management of the waters of the Basin by 2011. Until then, we will continue to secure contingency measures at the national level to maximise the water available to South Australia
- By 2050, in Greater Adelaide, we will have the capacity to turn 60 GL of stormwater into fit-for-purpose non-drinking quality water. The state-wide target will be 75 GL. We will also be able to recycle 75 GL of wastewater in urban areas – again, for appropriate purposes. These projects will be undertaken in partnership with the Commonwealth, Local Governments and the private sector
- To enhance the performance of the water industry as a whole, a greater emphasis will be given to water conservation, diversity of supply, transparent decision-making and independent scrutiny of service delivery and pricing. This will be critical to protect consumers and encourage innovation and efficiency
- Fresh legislation will be introduced following public consultation with the release of a discussion paper in 2009. The legislation will reflect a new approach to managing a more competitive and diverse water industry and an independent regulator will be appointed to oversee pricing, licensing and consumer protection
- An independent planning process will ensure that decisions about water supply augmentations will be transparent and timely, and result in efficient and innovative solutions
- SA Water and its predecessors have served South Australia well for more than 150 years and its institutional framework and customer service standards are strong. The Corporation will continue to play a major role in the water industry as a Government-owned entity. However, the State's water infrastructure will be opened up to provide third-party access and new entrants in the general water industry will be able to offer a range of water products
- Prices will need to increase over time to better reflect the full cost of producing and supplying water. Low-income households will continue to be protected from any equity implications that result from higher prices. Regional communities using SA Water's networks will also continue to be supported through the application of uniform statewide pricing
- Water-sensitive urban design will be mandated through new planning regulations which will dovetail with the Plan for Greater Adelaide and apply to new residential and commercial urban development
- Across the State, water security demand and supply plans will be in place to ensure that long-term solutions for each region are based on a thorough understanding of the state of local resources, the demand for them, and likely future pressures. Local knowledge is vital to meeting the economic, social, spiritual, cultural and environmental needs – and aspirations – of all communities
- Technology and innovation have created more water supply options, and community perceptions about their social or environmental benefit are changing. It is highly likely that, as technology improves and the price of water more accurately reflects the cost of supply, the viability and attractiveness of some options will change further. We will ensure that, in considering new ideas, we understand the full range of costs and benefits, including health and environmental, so that the right decisions can be made at the right time. We will also put the knowledge and systems in place so that we can be adaptable.

In summary, **Water for Good** actions include doubling capacity of the Adelaide Desalination Plant and significant increases in water recycling and groundwater management. Given this, the State Government has decided that it will not be necessary to continue with an involvement in the development of the Upper Spencer Gulf Desalination Plant planned by BHP Billiton to supply the Olympic Dam expansion.

Through actions undertaken to secure future water supplies any further expansion of storage capacity within the Mount Lofty Ranges will not be needed until at least 2050. However, our adaptive planning framework will review this option by 2025.

Towards a water-sensitive state

Through the implementation of the many wide-ranging actions in this Plan, South Australia will lead the country in water supply innovation and be recognised as the 'Water-sensitive State'.

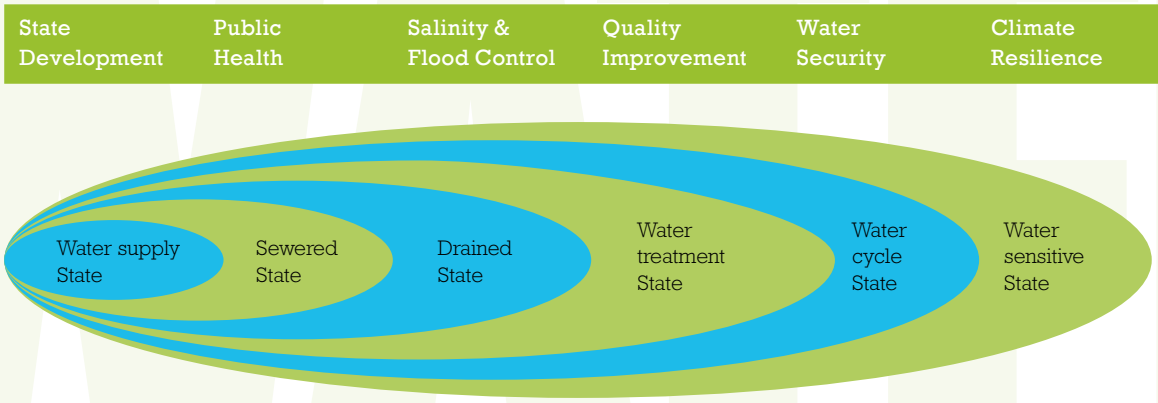
As a water-sensitive community, we will increasingly value our water resources and find new and effective ways to protect them. We will be more careful in how we use water for the things that are important to us, and use different sources – and qualities – of water to meet different needs.

Water-sensitive culture and values will be entrenched. Cities will be built in ways that contribute to the water cycle, and only sustainable developments will be approved.

Increasingly, systems on a neighbourhood scale – where communities capture, manage and use their water sources in an integrated way – will become the norm.

Most importantly, we will be well prepared to meet new challenges and

Figure 5
Moving towards a 'Water-sensitive State' (adapted from Urban Water Management Transitions Framework)
Source: Brown et al, 2008



State Development	Public Health	Salinity & Flood Control	Quality Improvement	Water Security	Climate Resilience	
1900s	1950s	1960s	1980s	2000s	2020	2050
Town & Country Networks	Sewers & STEDs	Rural & urban drains	Water Treatment Plants	Diverse Sources, Fit-for-purpose	Adaptive sustainable management	Cities as net contributors to water cycle
Water supply	Sewage treatment	Flood mitigation	Environmental protection	Water conservation	New water products	
			Salinity control	Catchment management		

manage future demands and declining rainfall through adaptive planning. This means we will seize opportunities to become nimble, smarter and more innovative in the way we use and manage our water.

To achieve all of this will require a shared understanding of the fundamental importance of maintaining the health of our natural water resources.

South Australians have always been resilient, creative and innovative. **Water for Good** will continue to move us quickly on the path to being considered Australia's leading water-sensitive state.

Navigating through the current situation

The State Government is managing many difficult issues as a consequence of continuing extremely low inflows to the southern Murray-Darling Basin.

Its critical short-term management actions include:

- As a last resort, building a temporary weir at Pomanda Island, to protect the water supply to the 1.2 million people currently receiving it from the River Murray below Lock 1. A temporary weir will only be constructed if inflows remain at critically low levels and agreed triggers for acidification or salinity were activated and could not otherwise be prevented
- Construction of temporary environmental regulators in the Goolwa Channel, Finniss River and Currency Creek to mitigate the impacts of acid sulfate soils
- Obtain the approvals to allow a small volume of seawater into Lake Alexandrina. This will only be undertaken if required to prevent acidification following implementation of all other options
- Substantial bioremediation programs for Lakes Alexandrina and Albert to manage acid sulfate soils
- Implementation of the South Australian $610 million *Murray Futures* program
- Purchase of water.

Key actions

By 2014

- Adelaide's water security will be enhanced through the supply of up to 50% (100 GL) of the city's water from the Adelaide Desalination Plant. The Plant will be powered by renewable energy
- We already harvest more stormwater than anywhere else in Australia. By 2013, we will be capable of harvesting 20 GL/a for non-drinking purposes in Greater Adelaide – more than double the amount of stormwater currently harvested. This will have been achieved in partnership with other governments and the private sector
- Subject to Commonwealth assistance and in partnership with local government, stormwater harvesting and recycling will be underway, including:
  - in the western metropolitan area including Cheltenham Park, Riverside Golf Club, Old Port Road and Adelaide Airport
  - in the southern metropolitan area, building on the first stage of Water Proofing the South
  - in Playford and Salisbury, creating further capacity in the northern area, building on Waterproofing Northern Adelaide
  - at the Adelaide Botanic Gardens, and
  - at Barker Inlet
- We will have the capability by 2013 to recycle 45% of wastewater from urban areas across the State
- Additional water sources including desalinated seawater subject to site and environmental investigations will supplement the Eyre Peninsula water resources
- Permanent water conservation measures will be maintained when new sources of water come on-line and water restrictions can be lifted
- Adaptable and regularly reviewed water demand and supply plans will cover all regions of the State
- The best regulatory approach to mandate water-sensitive urban design will have been implemented, and dovetail with the Plan for Greater Adelaide
- The statewide water monitoring system will provide more accurate and timely understanding of the state and condition of all water resources, particularly groundwater
- Region-specific scientific research will have improved our knowledge of the impacts of climate change on water resources across the State
- A single, new *Water Industry and Planning Act* will have replaced the legislation governing the operations of SA Water. The new legislation will be the foundation for establishing a new approach to managing a more competitive and diverse water industry, and conserving water use
- Local government has the lead role in stormwater management, owns stormwater infrastructure and is responsible for flood mitigation. To ensure appropriate emphasis to stormwater harvesting and reuse, the governance of the Stormwater Management Authority will have been reviewed and updated in conjunction with the LGA
- The long-term interests of consumers will be protected through comprehensive, independent economic regulation of urban water and wastewater services by the Essential Services Commission of South Australia (ESCOSA)
- The State's water infrastructure, currently managed almost entirely by SA Water, **will remain in State ownership** but will have been opened up to provide third-party access and new entrants in the general water industry will be offering a range of fit-for-purpose water products
- An independent planning process will be set up by the Minister where needed to make recommendations to maintain water supply standards, having regard to quantity and quality requirements and market response
- South Australia has taken the lead on the establishment of the independent Murray-Darling Basin Authority. We will be working with the new Authority and other jurisdictions to ensure a healthy, working River Murray that can continue to provide critical human water needs for Greater Adelaide and regional South Australia, irrigation requirements and water for the environment
- As a last resort, build a temporary weir at Pomanda Island to protect the water supply to the 1.2 million people currently receiving it from the River Murray below Lock One. The temporary weir would only be constructed if in-flows remain at critically low levels and agreed triggers for acidification or salinity were activated and could not otherwise be prevented
- The South Australian community will have an enhanced level of awareness of water issues and people will instinctively take action to save water, such that we are regarded nationally as a water-sensitive State.

By 2025

- Groundwater desalination plants or other economically viable innovative supply options will provide water for regional townships where water quality (ie: salinity) has been identified as an issue. This will enable improvements to these water supplies by 2025 at the latest
- We will target up to 35 GL/a of stormwater to be harvested in urban South Australia for non-drinking purposes to be achieved in partnership with other governments and the private sector. This will be achieved where verifiable geological data has identified suitable locations and where cost affective projects can be undertaken
- We will target to achieve 50 GL/a of recycled wastewater in urban South Australia to be used for non-drinking purposes
- We will aim to have increasingly open and competitive markets for water
- The South Australian community will have continued to enhance its level of awareness of water issues, and be taking actions to save water, such that we are regarded internationally as a water-sensitive state.

By 2050

- In Greater Adelaide, we will have a target to achieve the capacity to recycle at least 60 GL/a of stormwater for non-drinking purposes, with a target of up to 15 GL/a in regional areas. This will be achieved in partnership with other governments and the private sector. This will be achieved where verifiable geological data has identified suitable locations and where cost affective projects can be undertaken
- We will target to achieve a minimum of 75 GL/a of the wastewater generated in South Australian urbanised areas to be recycled for non-drinking purposes
- We have a target to be using 50 GL/a less water in Greater Adelaide by 2050 than would have been the case without the implementation of the conservation measures in this Plan including water-sensitive urban design
- Mature and competitive market arrangements will be in place and consumers will have far more choice
- Cities will be net contributors to the water cycle – through improving our water use and diversifying our water supplies.

South Australians lead the country in stormwater capture and reuse, irrigation practices, rainwater tank ownership and wastewater recycling.

Part 2
Current initiatives

Part 2
Current initiatives

Introduction

South Australia has had extensive experience with managing in dry conditions and making the most of our precious water resources.

In the current unprecedented dry conditions, the South Australian Government has acted to manage immediate impacts and to plan for an anticipated future that is likely to be drier than the past.

These actions have been built on a solid foundation of water resources management.

We have in place a strong legislative framework through the *Natural Resources Management Act 2004* (building on the *Water Resources Act 1997)* and the *Environment Protection Act 1993.*

Through our integrated water strategy *Water Proofing Adelaide – a thirst for change: 2005 – 2025* (WPA), we have put in place a range of initiatives to increase the efficiency of water use and develop alternative water sources. WPA has already achieved many milestones. A recent review found that nearly all of its strategies are 'on track' to be met, with 14 already completed.

South Australia has led the nation in a range of innovative water strategies – we are leaders in stormwater reuse and wastewater recycling. Around half our homes have a rainwater tank and more tanks are being installed every day. In fact, South Australia has the highest proportion (45.4 per cent) of households reporting a rainwater tank as a source of water.

Because we rely on many water resources that originate in other states and territories, we have also participated fully in the national reform agenda.

This part of the Plan outlines the national programs in which we are participating, our own strategies and initiatives, and some of the key actions we are progressing now to provide **Water for Good.**

National policies and reforms

- A number of important national reform and investment programs are contributing to water resource management in South Australia
- Recognition of the need for a more integrated and coordinated national approach to water management led to the development in 2004 of the *National Water Initiative*. This is a shared commitment by the Commonwealth, State and Territory governments to achieve a nationally compatible market, and an adaptive regulatory planning-based system of managing water resources. South Australia is a signatory to this initiative and is progressing the various water reforms. **Water for Good** will accelerate this progress and improve our capacity to manage our water resources
- Major reform of the Murray-Darling Basin has begun, with the establishment of the Murray Darling Basin Authority in 2008 and the development of a new Basin Plan, with a sustainability cap on surface and groundwater extractions. The reform program recognises the significant contribution the Basin makes to the Australian economy – $9 billion in agriculture alone – as well as the increasing pressure the drought is having on the health of the river system
- *Water for the Future* is the Australian Government's plan to develop a single, coherent, national framework that integrates rural and urban water issues to ensure the long-term security of the nation's water supply. Priorities include taking action on climate change, using water wisely, securing water supplies, and supporting healthy rivers. It also drives a significant investment program focused on strategic water priorities, including irrigation system rehabilitation, desalination and recycling projects, and buying back water entitlements. $12.9 billion has been committed over 10 years to support these initiatives
- In its January 2009 *Vision for a Sustainable Urban Water Future Position Paper*, the Water Services Association of Australia (WSAA) recognises that national action for the urban water industry is based on the issues of:
  - integrated water management
  - sustainable pricing
  - responding to climate change and carbon trading
  - industry structure and competition reforms
  - regulator reform.

State and regional strategies and initiatives

- *South Australia's Strategic Plan* (2007) contains seven main targets that are relevant to this Plan. These targets include: reducing greenhouse emissions and ecological footprint; managing water supplies within sustainable limits; supporting the development of renewable energy; maintaining regional share of South Australia's population (18%); and maintaining minerals exploration and increasing minerals production
- *The Natural Resources Management Act 2004* establishes eight regional boards across South Australia. Each is responsible for developing a Natural Resources Management Plan for its region. Where a water resource is prescribed, the Boards are required to prepare a water allocation plan, which deals with the allocation of the available resource
- *Water Proofing Adelaide* (2005) outlines actions for the management, conservation and development of Adelaide's water resources to 2025. When fully implemented, the actions in the plan are expected to provide up to 70 GL of additional water. These savings have been taken into account in the demand-supply forecasts in this Plan
- The *Water Proofing Adelaide* actions will continue to be important measures to reduce demand and have been incorporated in this Plan
- The State Government is developing a 30-year plan aimed at ensuring the future liveability, sustainability, climate change resilience and competitiveness of Greater Adelaide. To meet the future urban planning needs for our growing population, the plan identifies a new urban form that ensures continued economic prosperity, a sustainable lifestyle and a flexible planning approach. The *Plan for Greater Adelaide* will provide a vision for the city for the next three decades to coincide with South Australia's bicentenary in 2036.
- The Local Government Association of South Australia commissioned a report by the SA Centre for Economic Studies to conduct a survey into local government's current activities and potential future role in water management and conservation, including in relation to stormwater harvesting and use. The study demonstrates the important role of local government in this arena and emphasises the importance of collaboration with the range of organisations involved in managing water supplies in South Australia. Key findings of this study have been used to inform this Plan
- SA Water's long-term *Plan for the Eyre Region (2008)* establishes a framework to ensure the Eyre Peninsula has a secure water supply to meets its forecast increases in demand for the next 25 years. The plan identifies initiatives that complement a continued emphasis on water conservation and reducing water use, while enabling the region to grow and develop within sustainable limits. Development of similar plans for Kangaroo Island and Yorke Peninsula are currently underway.

Desalination

The Government has commenced construction of a 100 GL/a Desalination plant to be built at Port Stanvac. As a non rain-dependent source of water, this will relieve the pressure on the River Murray, delivering about a half of Adelaide's current water needs. The project will use renewable energy sources. A more detailed discussion of this initiative is in *Part 4 - Managing our water future.*

Water use

Managing and reducing our demand for water is a vital component in achieving **Water for Good**. South Australians are to be commended for their water saving efforts under permanent water conservation measures and level three water restrictions to date.

Key initiatives under way to help us reduce our water use include:

- Through the strategies identified in *Water Proofing Adelaide 2005* household water use will be around 30 GL a year less by 2025 than would otherwise have been the case. Strategies include encouraging more water-efficient devices in our homes and gardens; providing better community information, and the application of permanent water conservation measures which will stay in place when restrictions are no longer required
- A $24 million rebates package is helping householders reduce water use in their homes and gardens, accelerating some of the savings anticipated by *Water Proofing Adelaide*
- All large mains water consumers are implementing water efficiency plans to better manage their water use.
- Mains water used for public purposes such as watering parks and gardens, water used in public buildings and losses from the mains water system will be reduced by about 3 GL a year through strategies such as SA Water's leak reduction program and the Irrigated Public Open Space code of practice.

Stormwater recycling

South Australia is a leader in recycling stormwater and leads the nation in rainwater tank ownership.

Current uses of recycled water include irrigation, industrial uses, some non-drinking residential uses (e.g. garden irrigation and toilet flushing), and groundwater replenishment. Recent national guidelines, developed with South Australian assistance, provide uniformity for public health and environmental risk assessments for some uses.

Existing stormwater harvesting schemes in Adelaide generate 6 GL/a, with currently committed schemes expected to harvest an additional 12 GL/a.

Key projects include:

- Water Proofing Northern Adelaide – more than 20 integrated harvesting schemes.
  Project completion: 2010
- Metropolitan Adelaide Stormwater Reuse Project – about 800 ML a year to replace natural groundwater use in three metropolitan golf courses.
  Project completion: 2010
- Cheltenham Park – expected 1.2 GL harvesting capacity per year for irrigation, suitable residential and potentially for industrial uses.
  Project completion: 2012
- The Lochiel Park development aims to achieve 78 per cent savings in mains drinking water for each household compared to the average Adelaide household. This will be achieved through the use of approximately 38 ML of recycled stormwater for toilet flushing, washing machine cold tap connection and irrigation, and by using rainwater collected in tanks for all household hot water. Approximately 87 per cent of household and public space irrigation in Lochiel Park is supplied from recycled water.
  Project completion: 2010.

Wastewater recycling

Currently Adelaide recycles more of its wastewater than any other capital city. Already 30 per cent of our treated wastewater is recycled each year for irrigation use, toilet flushing and garden watering - and this is set to increase.

A range of significant wastewater projects is under way to increase reuse to nearly 45 per cent.

Increased recycling of wastewater will provide more water for agriculture, community parks and gardens, and reduce the flow of nutrient discharge into the sea where it can harm our delicate marine environment.

Key projects include:

- Water Proofing the South (Stage 1) – approximately 4.4 GL per year for agricultural, viticultural and urban reuse of wastewater. This project also includes approximately 850 ML a year stormwater recycling.
  Project completion: 2011
- Glenelg-Adelaide Parklands Recycled Water Project – 1.3 GL per year recycled water for Parklands use, with the capacity to recycle a total of 5.5 GL a year.
  Project completion: 2010
- Statewide Water Recycling Project – approximately 8.5 GL a year reuse from local council Community Wastewater Management Schemes.
  Project completion: 2010
- Additional Bolivar Wastewater Treatment Plant Reuse, Playford Alive Blakeview Project (Stage 1).
  Project completion: 2011
- Aldinga Wastewater Treatment Plant – All treated water from this plant (approximately 328 ML a year) is reused, approximately 328 ML per year, predominantly by the Willunga Basin Water Company for local irrigators
- Port Augusta West Sewer Mining Project – recycles 180 ML a year for irrigation of community parks and gardens
- Whyalla Wastewater Reuse – recycling 600 ML a year to irrigate parks, gardens and a golf course

- Victor Harbor Wastewater Reuse – recycling 115 ML a year to irrigate the golf course and a private vineyard
- Berri Barmera Wastewater Reuse Project – recycling 600 ML a year for irrigation purposes
- Loxton Waikerie Wastewater Reuse Project – recycling to irrigate the local golf course
- Extension of the Virginia recycled water pipeline to Angle Vale – providing an additional 3 GL a year, taking the total to 18 GL a year of recycled water use
  Project completed May 2009
- Bolivar and Christies Beach Wastewater Treatment Plants – about 40 per cent of the wastewater from these plants is currently treated and reused
- Country Wastewater Treatment Plants – high levels of reuse are currently occurring at some wastewater treatment plants, including Gumeracha, Mannum and Murray Bridge
- Community Wastewater Management Schemes – local councils are achieving high levels of reuse from these schemes
- Mawson Lakes – when fully developed in 2010, Mawson Lakes will cater for approximately 10,000 residents. A major feature of the development is the innovative $16 million water recycling system which complements the mains water supply. Recycled water is derived from sewerage systems and treated to a standard which is suitable for non-drinking purposes.

Caring for our rivers, reservoirs and aquifers

While our water is supplied from various sources, much of the State is dependent on the River Murray for its supply. In an average rainfall year, Adelaide captures about half its needs in the Mount Lofty Ranges catchment but our reservoirs can only hold a 12-month supply.

Many parts of the State also use groundwater resources for domestic, industrial and irrigation purposes.

While we will continue to diversify our water sources, the Murray, our reservoirs and groundwater will remain significant and it is essential we manage them well to ensure they remain available to future generations.

By improving the health and efficiency of our rivers and catchments, increasing our storage capacity and managing groundwater reserves across the State, we will help secure our water supplies.

The South Australian Government has successfully negotiated with the Commonwealth to establish an independent authority to better manage the Murray-Darling Basin. In addition, we have obtained significant Commonwealth funding for the *Murray Futures project* which is outlined in further detail in *Part 4 – Managing our water future.*

An independent water audit has begun and water licences in other states will be purchased to provide more water for the River Murray in South Australia.

Other initiatives undertaken since 2003 include:

- *The Natural Resources Management Act 2004* provides for an integrated and transparent natural resources management system aimed at ensuring, among other things, that our water resources are managed sustainably
- The Commonwealth Government's *Restoring the Balance in the Murray-Darling Basin Program* aims to improve the health of the basin by purchasing water entitlements from willing sellers and using the water for the environment
- Salt interception schemes (SIS), one of the main approaches to achieve South Australia's salinity management objectives, prevented about 150,000 tonnes of salt from entering the River Murray during 2008
- Prescription of key areas of the Mount Lofty Ranges and Adelaide Plains to ensure careful management of those resources.

Population growth and a changing climate mean we must not only deal with a challenging current situation, but remain focused on longer-term goals of securing, protecting and diversifying our water sources while improving supply infrastructure in a way that supports our economy, sustainability and prosperity.

Part 3
The challenges of demand and supply

Part 3
The challenges of demand and supply

Introduction

Traditionally, governments have planned for water supply on the basis of historical long-term average inflows and invested in system augmentations to meet future demand. Until recently, solutions have largely revolved around rain-dependent sources of water such as large dams, rivers and groundwater.

The current severe and prolonged dry has changed this approach. Ten years of low inflows into both the River Murray and local storages have taught us that historically-based projections no longer provide planning certainty, and that we can no longer rely solely on rain-dependent sources of water to meet future demand. This trend is consistent across much of southern Australia.

This section of **Water for Good** describes South Australia's main water sources, how they are accessed and used, and the demands that will likely be placed on them in the future. It also looks at the implications of a changing climate. Finally, it describes a process for making adaptable and flexible decisions in a timely manner about securing our water into the future.

Key points

- South Australians used approximately 1200 GL of water from all sources, with agriculture being the largest user (934 GL in 2007-08)
- In 2008, the Greater Adelaide region used about 163 GL of mains water. This represented approximately 73 per cent of South Australia's total annual mains water consumption
- A combination of water restrictions and other demand management strategies reduced consumption in Greater Adelaide in 2008 by an estimated 50 GL
- The State Government, through SA Water, will continue to be the main provider of the majority of mains water supply and wastewater infrastructure. Water will remain in public ownership, but will be open to new entrants
- All irrigation infrastructure is privately owned and operated in South Australia
- By 2050, South Australia's population is expected to reach 2.49 million people
- Climate change impacts (temperature increases and inflow reductions) are expected to increase demand – and reduce supply – in the Greater Adelaide region
- Future water demand in Greater Adelaide will be mostly influenced by population growth, while future supply will rely on the creation of new water sources, such as desalination and stormwater recycling, to counter, in particular, reducing surface inflows to the Mount Lofty Ranges reservoirs
- Desalination will reduce Adelaide's reliance on the River Murray and lead to a healthier river. However, we will still need sufficient water to flow into South Australia to sustain domestic, irrigation, dilution, transmission and environmental uses across the State
- To manage the future uncertainty of demand and supply, **Water for Good** and the regional plans that will follow it, will need to be regularly reviewed, adaptive in nature, and underpinned by water supply reliability standards and trigger points.

Actions and outcomes

Outcome

Water for Good regional water demand and supply plans are regularly and robustly reviewed and updated.

New actions

Establish an adaptable management framework, incorporating an annual review process, to assist in making timely and appropriate decisions to provide ongoing water security throughout the State.

The Minister will produce an annual statement that will:

- assess progress of the Plan and identify any risks or issues
- review and confirm water security standards for the upcoming review period
- provide demand-supply status for each region
- identify and analyse impacts of any emerging issues

The Minister will establish an independent planning process if demand and supply forecasts indicate a gap is likely to exist in the foreseeable future.

Our water sources

South Australia's water supply comes from the following, principally rain-dependent, sources:

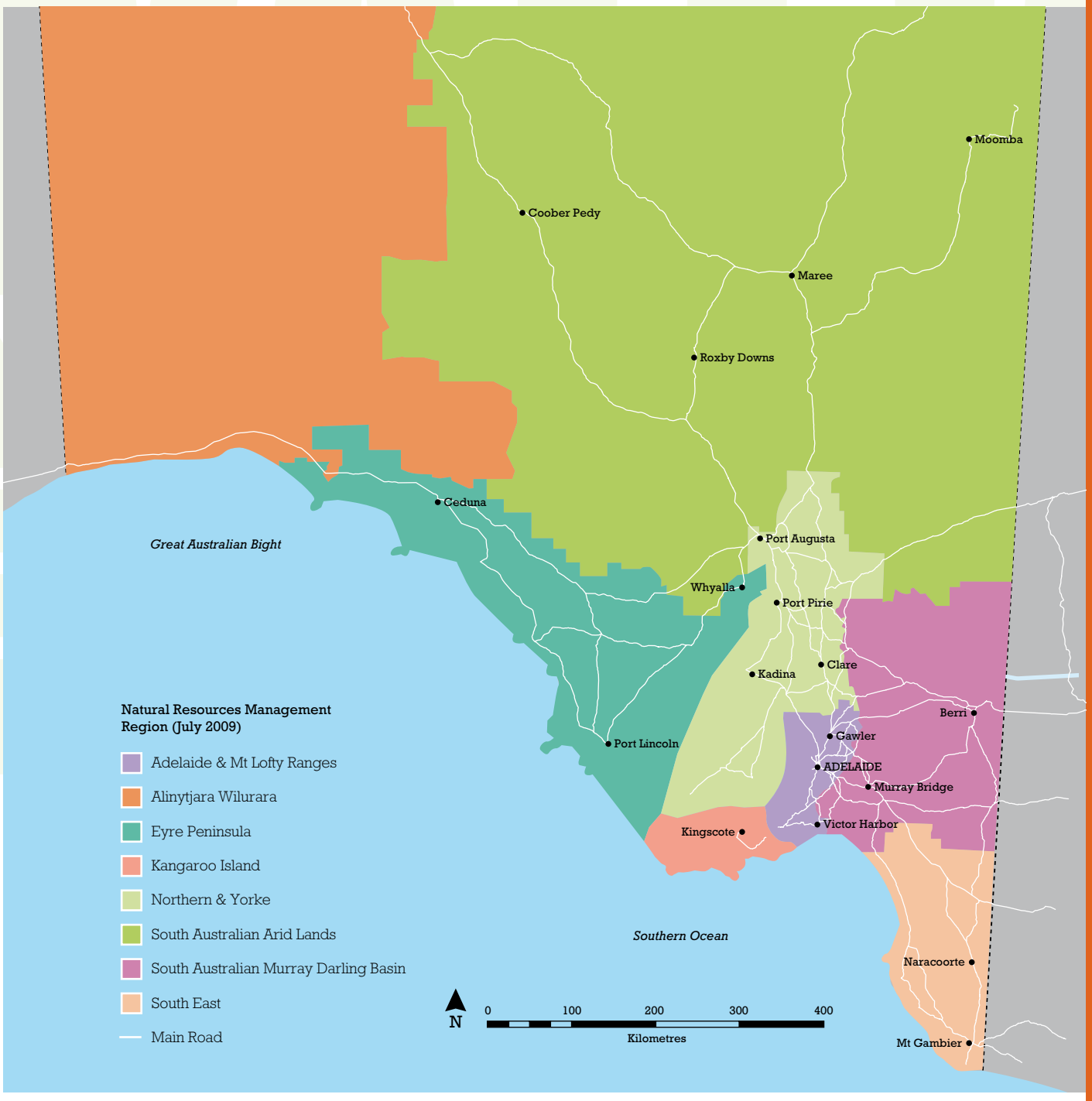
- the River Murray
- local catchments
- groundwater
- recycled stormwater
- treated wastewater
- local rainwater
- desalinated water.

Across the State, resources vary considerably. For the purpose of identifying and assessing them, this Plan uses the boundaries of the existing eight Natural Resources Management (NRM) regions:

- Adelaide and Mount Lofty Ranges
- South Australian Murray Darling Basin
- Northern and Yorke
- South East
- Eyre Peninsula
- South Australian Arid Lands
- Kangaroo Island
- Alinytjarara Wilurara.

These boundaries have been chosen as they represent manageable sized areas and align with current water resource planning processes undertaken by the Natural Resources Management Boards which oversee them. The regions are shown in Figure 6 below, with new boundaries to come into effect from 1 July 2009.

Figure 6
Natural Resources Management Region boundaries



A summary of the water resources in each region is provided in Table 1. It highlights the great diversity in water sources, as well as future opportunities and threats. More detail about each region will be provided on the **Water for Good** website.

Table 1
Regional water sources

Natural Resources Management Region	Major population centres	Total population (2006 census)	Major water resource(s)	Major water opportunity	Major challenge to water resource	Major water use in region
Adelaide and Mount Lofty Ranges	Adelaide Barossa Valley Victor Harbor	1,179,347	Imported River Murray water, Mount Lofty Ranges watershed	Diversifying water sources through desalination, use of recycled wastewater and stormwater	Climate change and population growth	Residential and primary production
South Australian Murray Darling Basin	Murray Bridge Mt Barker Riverland	108,839	River Murray Groundwater Eastern Mount Lofty Ranges	Murray Darling Basin Plan and water trade	Over extraction, salinity and acid sulfate soils	Irrigation, stock and domestic and urban residential
Northern & Yorke	Port Pirie Port August Kadina	89,198	Imported River Murray water and the Clare Valley prescribed water resources	Desalination and wastewater reuse	Climate change and coastal development	Residential, viticulture and stock and domestic
South East	Mt Gambier Naracoorte	63,878	Groundwater – unconfined aquifer	Groundwater – confined aquifer and wastewater reuse	Climate change and forestry	Irrigation, town water supplies and stock and domestic
Eyre Peninsula	Whyalla Port Lincoln	54,658	Imported River Murray water and groundwater	Seawater desalination, wastewater reuse and stormwater reuse	Climate change and mining	Town water supplies, stock and domestic and irrigation
South Australian Arid Lands	Roxby Downs Coober Pedy Leigh Creek	9,083	Groundwater – Great Artesian Basin	Other groundwater resources, desalination of groundwater resources	Decreases in artesian pressure, mining and cross border management	Pastoral, mining and petroleum, town water supplies
Kangaroo Island	Kingscote American River Penneshaw	4,259	Middle River catchment Penneshaw Desalination Plant	Expanding catchment storage, seawater desalination and wastewater and stormwater reuse	Climate change, commercial forestry expansion and farm dams	Town water supplies and stock and domestic
Alinytjarara Wilurara	Anangu Pitjantjatjara Yankunytjatjara Lands Maralinga Tjarutja Lands Yalata Aboriginal Reserve	2,457	Groundwater	Desalination of groundwater and wastewater reuse	Mining and a lack of information relating to the capacity of the groundwater resources in the region	Town water supplies and stock and domestic

How we use our water

South Australia's water use currently totals approximately 1200 GL/a, with the majority used for agriculture (about 75 per cent).

Figure 7 below shows how the use of River Murray water in South Australia varies in non-drought and drought years.

Figure 8 shows mains water consumption by NRM region. Not surprisingly, the Adelaide and Mount Lofty Ranges Region has the greatest level of mains consumption, as this is the State's largest population centre.

The Greater Adelaide region also uses groundwater, rainwater sources, and fit-for-purpose alternative supplies, such as recycled wastewater and stormwater for non-drinking uses.

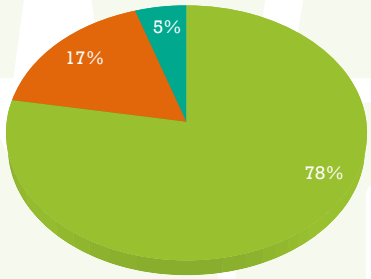
As well as Greater Adelaide, population centres in the South Australian part of the Murray-Darling Basin, the Northern and Yorke NRM region and parts of Eyre Peninsula and the South East are connected to the River Murray. Supply augmentations and demand management strategies that work to improve net water availability in the Greater Adelaide region can therefore also help in these regions.

The remainder of the State relies mainly on local groundwater for all water uses.

Figure 7

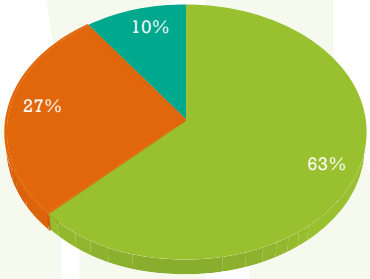
South Australia's use of the River Murray in non drought and drought years

South Australia's use of the River Murray in non drought year (2004-05) with irrigation at 100% allocation



Murray Irrigation
Greater Adelaide
Country Towns

South Australia's use of the River Murray in drought year 2007-08 irrigation at 32% allocation and SA Water customers at Level 3 enhanced restrictions

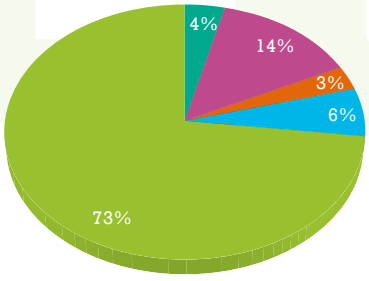


Murray Irrigation
Greater Adelaide
Country Towns

Figure 8

Mains water consumption according to NRM region

Source: SA Water, 2009; average mains water consumption 1999-2008.



Adelaide & Mount Lofty Ranges
Kangaroo Island
Arid Lands
Eyre Peninsula
Northern & Yorke
South East
SA Murray Darling Basin

Water use in the Greater Adelaide region

In looking at current and future demand for the city and its environs, this Plan uses the same boundary as the draft *Plan for Greater Adelaide*. The area includes all of the Adelaide and Mount Lofty Ranges Natural Resources Management (NRM) region, as well as part of the SA Murray-Darling Basin NRM region.

This definition of Greater Adelaide extends beyond the boundary defined in the *2005 Water Proofing Adelaide* strategy, and incorporates the Mallala and Light Councils, as well as Murray Bridge. In Appendix 1, the area boundaries used in previous studies are described in more detail. It should be noted that demand from the SA Water system for the Greater Adelaide area defined in this Plan is approximately six per cent more than for the area defined in *Water Proofing Adelaide*.

Greater Adelaide region water supplies

The supply system for the Greater Adelaide region is complex. The availability of water is determined by: inflows to major storages; the capacity of these storages (and those upstream in the River Murray); the system's ability to supply water and to transfer it to where it is needed; and the availability of any alternative non rain-dependent supplies and strategies to encourage reduced water use.

Historically, the Greater Adelaide region has relied on rain-dependent sources of water from the River Murray, the Mount Lofty Ranges (MLR) and groundwater sources. Unlike the Sydney and Melbourne supply catchments, which have a capacity to maintain water supplies during drought periods for around three to four years, MLR storages have the capacity to store sufficient water to meet only 12 months supply. South Australia has recently negotiated for the capacity to store water upstream in the Murray-Darling Basin storages, as a strategic reserve.

Depending on seasonal conditions, between 10 and 90 per cent of Greater Adelaide's mains water supply is met by the MLR storages. The average is 60 per cent. For more than 50 years, the balance of mains water supply required for the region has been met by the River Murray.

Under current drought conditions South Australia is entitled to 696 GL/a, in minimum flows, for dilution and evaporative losses, plus a critical human needs allocation of 201 GL/a, which includes metropolitan Adelaide and country towns. This takes the total minimum flow supply into the SA River Murray system to approximately 900 GL/a. In normal circumstances (non-dry periods) South Australia's minimum entitlement is 1850 GL and SA Water has a five-year rolling licence of 650 GL for metro and an annual licence of 50 GL for country towns. The amount of water drawn from the River Murray each year varies. Table 2 shows that, during years where there is lower than average rainfall, the reliance on the River Murray as a water source increases substantially.

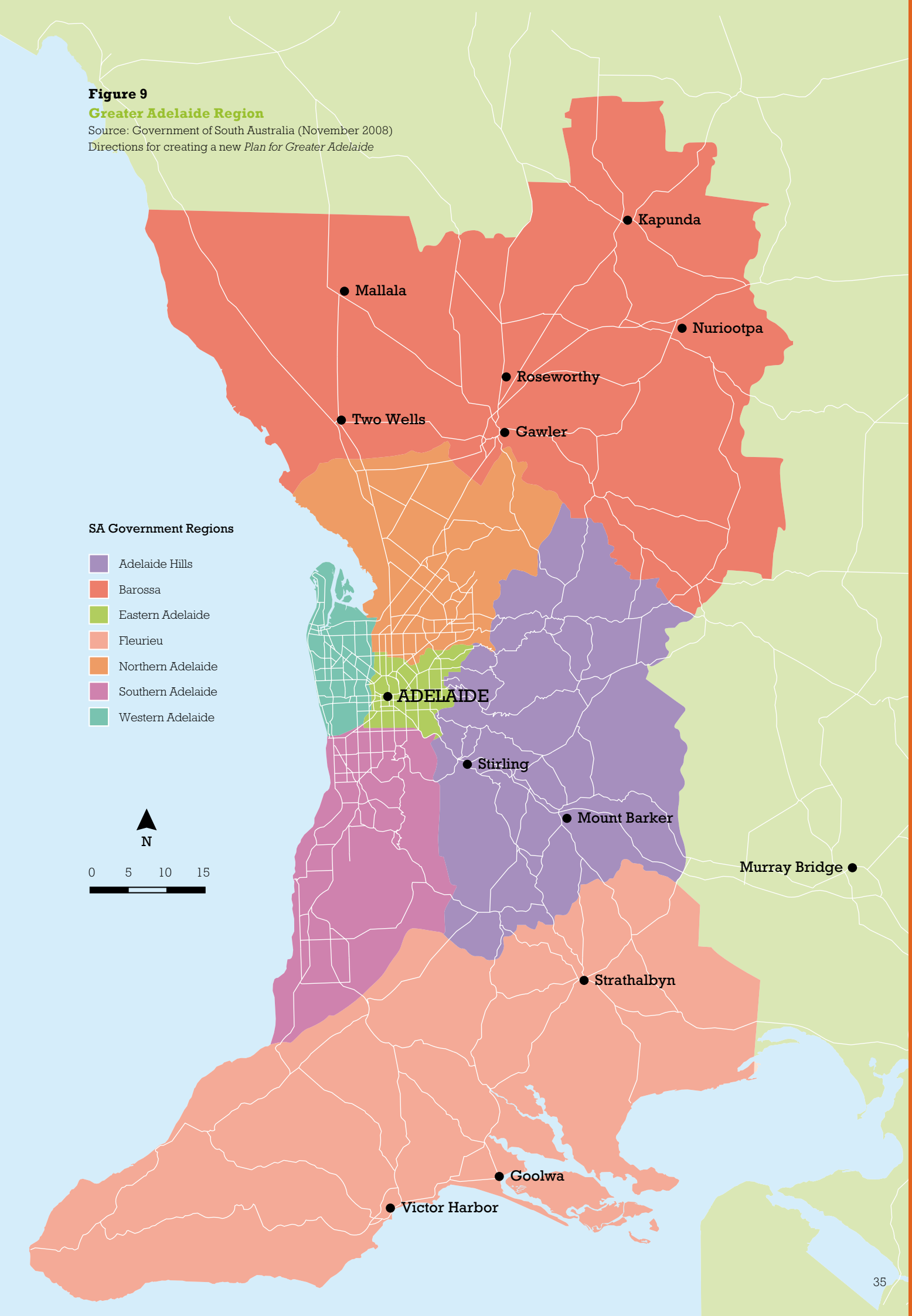
Table 2
Per centage reliance of total source of potable water for period 2002-03 to 2007-08

Source of potable water	Per cent of total source					
	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08
River Murray	72	48	44	49	91	85
Surface water	22	45	50	45	3	8
Groundwater	6	7	6	6	6	7
Desalinated water		<1	<1	<1	<1	<1

Figure 9

Greater Adelaide Region

Source: Government of South Australia (November 2008)
Directions for creating a new *Plan for Greater Adelaide*



When compared with overall extractions, the volume of water taken from the River Murray – and, as such, from the Murray-Darling Basin – for South Australia's urban supplies is small (around one per cent). Total South Australian extractions from the River Murray, including for agriculture, represent around six per cent. (Table 10)

Demand for water in Greater Adelaide

The Greater Adelaide region's mains water use is dominated by residential use, as shown in Figure 11 below, with industrial and commercial uses making up a relatively small amount of the total.

Across Australia's major cities, average water use per property is decreasing, largely through the widespread need for water restrictions. As Figure 12 on the following page shows, Adelaide remains one of the higher water consuming cities. This is partly due to the size of our housing blocks, the age of many of our buildings, and our warmer and drier conditions. For example, the average maximum temperature is 22°C compared with 20°C in Canberra and in Melbourne; and Adelaide received 417 mm of rain over the past year, compared with 1082 mm in Sydney. Melbourne's rainfall has declined considerably in recent years and its total for 2008 was 450 mm.

Mains water use in the Greater Adelaide region has certainly reduced over the past ten years. Despite a noticeable drop in mains water consumption in 1993 (a 'wet year'), Greater Adelaide's consumption trend was rising steadily but gradually, year on year, until 2001, when total consumption fell sharply. This was in response to the call to save water and the introduction of temporary water restrictions, followed soon after by permanent water conservation measures.

In 2008, water consumption in Greater Adelaide fell to its lowest level since 1983. This was due to enhanced water restrictions and other demand management measures combined with the community's efforts to conserve water. An overall reduction in water use between 1983 and 2008 was achieved despite increased population and economic growth.

Figure 10
South Australian's share of Murray-Darling Basin Water

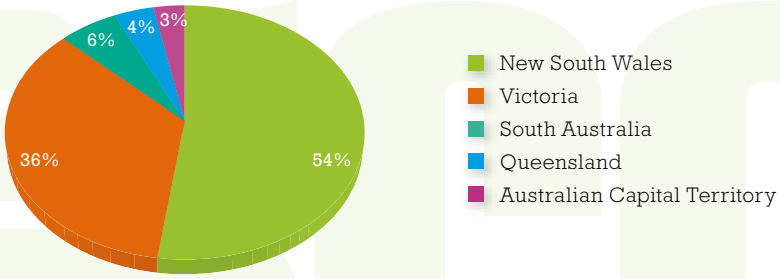


Figure 11
Greater Adelaide's mains water uses

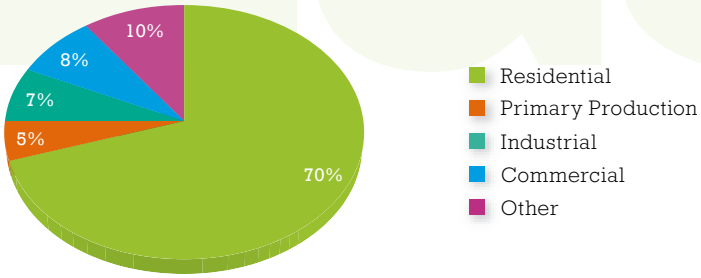


Figure 11 is updated from earlier prints of Water for Good

SA Water's estimates of the underlying demand for Greater Adelaide suggest that, were water restrictions not in place, the demand for 2008 would have been approximately 216 GL for the year. The gap between the two trend lines shown in Figure 13 represents the estimated water savings from permanent water conservation measures and water restrictions. The gap would suggest that these actions reduced Greater Adelaide's mains water consumption by an estimated 50 GL in 2008.

Figure 12
Average annual residential water use

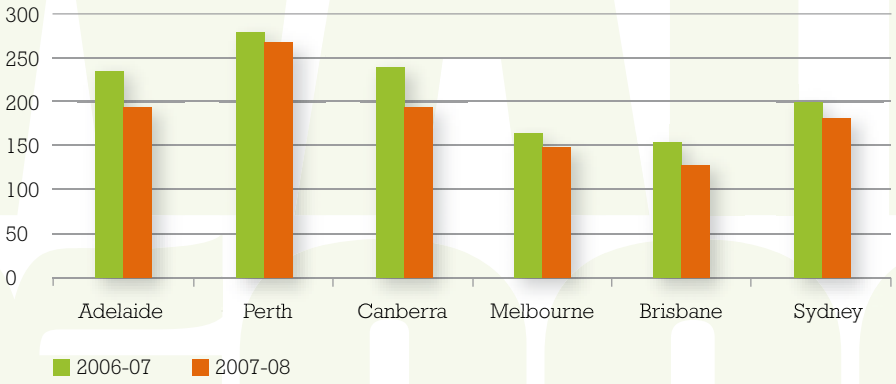
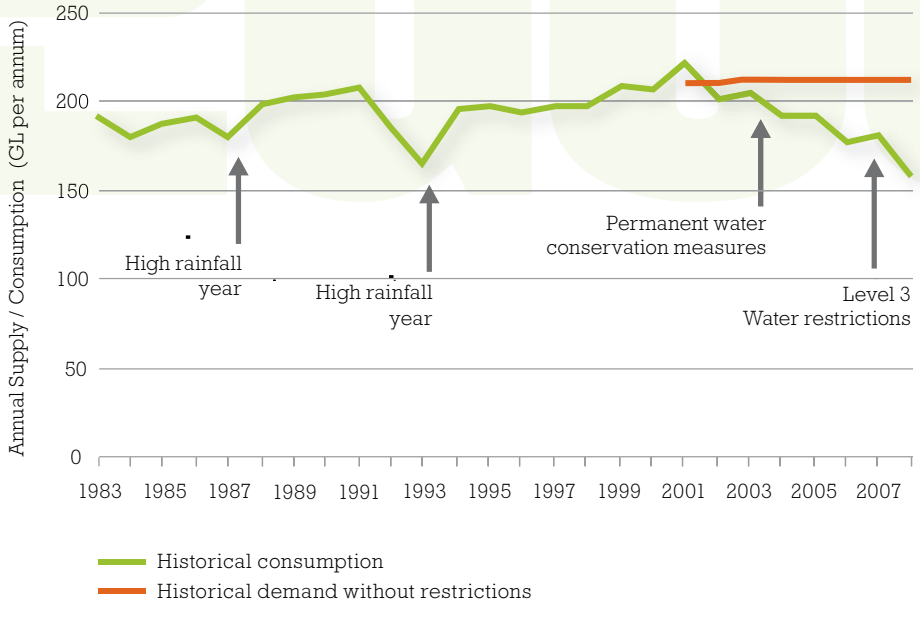


Figure 13
Historical mains water consumption for Greater Adelaide to 2008



Household use

Average household mains water consumption prior to water restrictions was 280 kL per year. For a typical household, 60 per cent of water was used indoors and the remaining 40 per cent outside, predominantly on the garden. The amount of outdoor watering can fluctuate significantly from one year to another, depending on the weather and water conservation and restriction measures.

In periods of water restrictions the situation changes, with average annual water use per household in the metropolitan area falling to 193 kL in 2007-08. Reductions are most noticeable in outside watering, although some reduction in inside use was achieved through the installation of water saving devices, such as dual-flush toilets and more efficient washing machines. Even when water restrictions are lifted, it should be possible to maintain much of the savings achieved to date through the installation and ongoing use of water saving devices.

However, in Greater Adelaide we continue to use more water than many other capital cities and we will need to continue to improve efficiency at the household level.

Primary production

The agricultural areas around Adelaide are an important source of food for the State and for export markets. Market gardening, fruit cropping and grazing rely on a variety of water sources, including farm dams, local watercourses, groundwater and treated wastewater. Primary production generally uses groundwater, recycled water or farm dams rather than mains water.

Public purposes

Water for public or community purposes typically accounts for 17 per cent of the total water use. Government agencies, universities, schools and local government use community-purpose water to maintain parklands, open spaces, sporting grounds, places of worship and gardens. The supply comes from a mix of mains water, groundwater, stormwater, rainwater and surface water.

Commercial and industrial

Industrial and commercial users are generally manufacturers, retail traders and office buildings. Together they account for approximately 10 per cent of total annual water use and 15 per cent of mains water use. An opportunity exists to retro-fit older buildings to make them more water wise. Water quality standards required by industry vary widely. Some are able to use non-potable groundwater, while others need to treat mains water to a higher standard.

How we move and supply our water

Water is a heavy product and is needed in large volumes across South Australia. This makes the infrastructure needed to shift it expensive to build and run. SA Water's existing water infrastructure is shown in Figure 15.

Some pipelines have additional capacity available (e.g. the Murray Bridge to Onkaparinga pipeline), while others are near capacity (e.g. the Mannum to Adelaide pipeline).

SA Water collects and treats wastewater from residential, commercial and industrial customers in the Adelaide metropolitan area through a network of sewers, pumping mains and treatment plants.

The corporation's asset management framework provides the basis for ensuring its the pipelines retain the capacity and condition to meet current and future demands – or that suitable alternatives can be determined and implemented in a timely manner.

Figure 14

Household water use split pre- and post- water restrictions

(Source Water Proofing Adelaide 2005 and information from the Office for Water Security 2009)

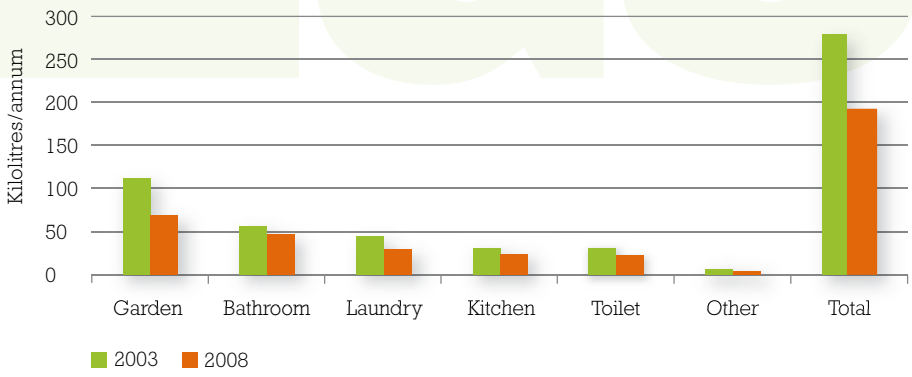


Figure 15

Major pipelines, reservoirs and mains water bore fields in South Australia

Taken from SA Water Quality Report 07-08

Non-metropolitan water supply and wastewater infrastructure

SA Water supplies residential, commercial, industrial and agricultural customers in the non-metropolitan area with mains water via its network of pipelines that link either to the treatment plants, storage tanks and the River Murray, or to individual bore fields where groundwater is used.

SA Water also collects and treats wastewater from residential, commercial and industrial customers in major regional centres via its gravity network of sewers, pumping mains and treatment plants.

Local government provides water and wastewater services for the majority of non-metropolitan towns not covered by SA Water, primarily through local groundwater supply systems and common effluent disposal schemes.

Rural irrigation supply infrastructure

In the Riverland, individual private trusts source water directly from the River Murray and provide it to customers – untreated – via their own infrastructure. The Central Irrigation Trust collectively manages nine individual trusts at:

- Mypolonga
- Cadell
- Waikerie
- Kingston
- Moorook
- Cobdogla
- Berri
- Loxton
- Chaffey

There are three other major trusts:

- Golden Heights
- Renmark
- Sunlands.

All these systems are fully piped and irrigators have adopted improved irrigation practices to maximise water efficiency.

In the Lower Murray, flood irrigation of pasture on the river flats still occurs, and this is considered appropriate for the heavy soils of that area. Recent government-assisted rehabilitation of the systems has taken place and has greatly improved irrigation efficiency.

The grower-owned company, Barossa Infrastructure Limited, has installed a pipe network to distribute River Murray water for the supplementary irrigation of vineyards in the Barossa Valley. The company has its own River Murray water licence, and has entered a commercial arrangement to deliver this water via SA Water's infrastructure.

The Langhorne Creek Pipeline Company supplies River Murray water to Langhorne Creek irrigators through its own infrastructure.

In the South East, irrigators operate their own infrastructure, predominately using bore systems to extract and distribute groundwater, predominantly via centre pivot irrigation systems.

Recycled water infrastructure for irrigation use

Wastewater from the Bolivar Treatment Plant is treated by SA Water and distributed to irrigators via the Virginia Pipeline Scheme. Under a similar arrangement, the Willunga Basin Water Company takes treated wastewater from the Christies Beach Wastewater Treatment Plant and distributes it to customers. Smaller reuse schemes exist in country centres, including Whyalla, Port Augusta, Mannum and Millicent, through a combination of public and private infrastructure.

Infrastructure to harvest stormwater for irrigation (e.g. diversion structures, wetlands, injection and recovery bores) is becoming increasingly common, particularly in new developments in the Adelaide metropolitan area. This infrastructure is largely owned and operated by councils.

Desalination infrastructure for potable and irrigation use

More than 50 private desalination plants operate in South Australia, although most are small plants using brackish groundwater or seawater for non-potable uses like irrigation.

The South Australian Government has commissioned a major desalination plant to provide drinking water for Greater Adelaide. More detail regarding this project is provided in Part 4 – *Managing our water future*.

In terms of potable water, SA Water operates a 300 kL/day plant at Penneshaw on Kangaroo Island; the District Council of Coober Pedy produces and reticulates its own water that is piped in from a bore 25 km north-east of the township; and the District Council of Yorke Peninsula has constructed a small seawater desalination plant at Marion Bay, and this supplies a hotel and caravan park.

A desalination plant providing potable and process water also operates at Roxby Downs.

Key drivers for demand and supply

Over the next 40 years, a number of factors could affect the demand and supply balance for regional South Australia and lead to a surplus or deficit. The effect is likely to vary, region by region.

In the past we have relied on experience and historical knowledge to plan for the future. However, in a changing climate this approach is no longer adequate because rainfall and inflows to traditional storage systems are increasingly variable and cannot be relied on to provide water security. To better determine our future water supply and the demands it will face, we need to understand what will influence water availability. The key drivers will be climate and population growth.

A range of other factors also impact water supply and demand, including changing housing stock and occupancy rates, growth in the economy and key industry sectors, and significant land use changes. Each of these, however, is regionally specific and variable. An assessment of their relative importance will be undertaken when water demand and supply scenarios are developed for each region.

South Australia's future economic conditions

Australia faces a period of change and uncertainty in the immediate future. The South Australian Economic Development Board's March 2009 *Economic Statement* indicates that the State's prospects for future growth over the next decade remain strong. It says the current economic conditions are expected to be short lived, with economic recovery expected to begin at the end of 2010. It also indicates a number of areas where South Australia could capture emerging economic opportunities during this period of change.

Access Economics forecasts that South Australian economic growth will exceed the national average between 2008-09 and 2010-11. This follows on from the State recording stronger economic growth than the national average in 2007-08 and the only State to record growth in State Final Demand in the March quarter 2009.

In economic terms, in many respects what happens in Greater Adelaide drives what happens in the rest of South Australia, as the region is the 'engine room' of population and economic activity. For example, Greater Adelaide is responsible for 71 per cent of total South Australian economic activity and 68 per cent of total South Australian employment.

In the regions mining and renewable energy will become key drivers.

In the past two decades South Australia has recorded increased productivity and record levels of economic performance. It has grown at about 130 per cent in nominal terms since 1990. In April 2009, Greater Adelaide had 792,700 employed persons and an unemployment rate of 5.8 per cent, which was in line with the Australian average.

Figure 16 below outlines the State's growth in employment. The major industries include defence, manufacturing, services, information and communications technology (ICT), primary production, mining and green industries. The latter has been stimulated by new policies and investment in renewable energy and energy efficiency.

Water security gives industry the necessary pre-conditions for investment and economic certainty.

Changes in the world's dominant markets will have an impact on South Australia's economy and the make-up of its industries. Developments in the construction, mining, renewable energy and defence sectors are expected to contribute positively to the State's economy in the medium to long term. In 2008, South Australia's mining exploration accounted for more than 13 per cent of the national total. Growth forecasts for the next two years have, however, been downgraded in light of the current economic situation.

The actions outlined in this Plan, when combined with those in other key documents such as the *Plan for Greater Adelaide*, should provide confidence and certainty and, in themselves, act as a stimulus to the economy.

The adaptive management approach outlined later in this chapter will activate action before demand exceeds supply. If future growth is below or above projections, trigger points either will or will not be activated. This will ensure that additional measures to increase water supplies, or reduce demand, are both timely and cost effective.

Increasing population

Two million people are expected to be living in South Australia by 2027, about 23 years ahead of the target in both *South Australia's Strategic Plan* and the *Prosperity Through People* population policy (2004).

By 2050, the population is expected to be 2.49 million – 60 per cent more than in 2008 (1.56 million).

The SA Department of Planning and Local Government has modelled population projections for the region to 2036 for the *Plan for Greater Adelaide*. **Water for Good** uses scenarios based on these population growth projections but has extrapolated them to 2050.

Greater Adelaide is expected to grow by about 300 people a week over the next 30 years. This growth is moderate when compared with Sydney (up to 1200 a week), Melbourne (up to 1500 a week) and Brisbane (up to 1100 a week), but will nevertheless need to be carefully managed.

Over the past 25 years, South Australia's population has grown as a result of overseas migration (5200 residents a year) and natural population increase (7600 residents a year). In 2008, overseas migration increased to 14,200, reflecting a change in the State's migration status. Consequently, about 65 per cent of population growth is now due to overseas migration.

Strong and well-managed population growth is a principal driver of prosperity and good economic performance.

A growing, diverse population strengthens the economy by providing an accessible labour market to support growing and changing industries. Population growth also strengthens consumer markets such as retail and financial services, which can provide a variety of jobs in decentralised locations.

A growing population also provides the economic base for governments and the private sector to invest in improving key infrastructure such as public transport, health and education facilities.

South Australia will see a transformation in the make-up of its population in the years to 2050. There will be a greater proportion of people aged over 65 and a significant increase in the number of one-person households and couples without children.

South Australia's population is older than the Australian average. In addition, in the 10 years to 2006, the proportion of people aged 50 years and over increased from 28 per cent to 34 per cent of the total population, while the national average increased from 26 per cent to 31 per cent.

Figure 16

South Australia's employment growth for the period April 1999 to 2009

Source: Labour Force, Australia (category number 62020)

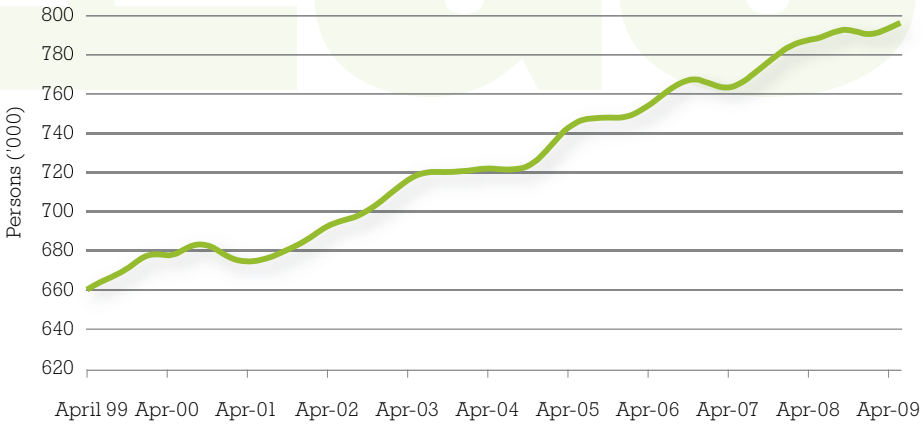


Figure 17 shows the projected population growth for the Greater Adelaide region to 2050. The second line represents previous population targets under *South Australia's Strategic Plan*.

A changing climate

There is strong scientific evidence that climate change is occurring in Australia. The Inter-Governmental Panel on Climate Change (IPCC) and the Commonwealth Government say that climate change influenced by human behaviour is already occurring and that further climate change is now inevitable, regardless of how rapidly greenhouse gas emissions are reduced. Climate change means we must be flexible and nimble in our planning.

The IPCC, in its *Fourth Assessment Report* released in 2007, advised that the link between human activity and a large proportion of global temperature increases over the past 100 years was 'unequivocal'. Global surface temperature increased by 0.7°C in the past century. In Australia, the increase has been 0.89°C, and in South Australia it has been 0.96°C. More rapid changes have been noted since 1950.

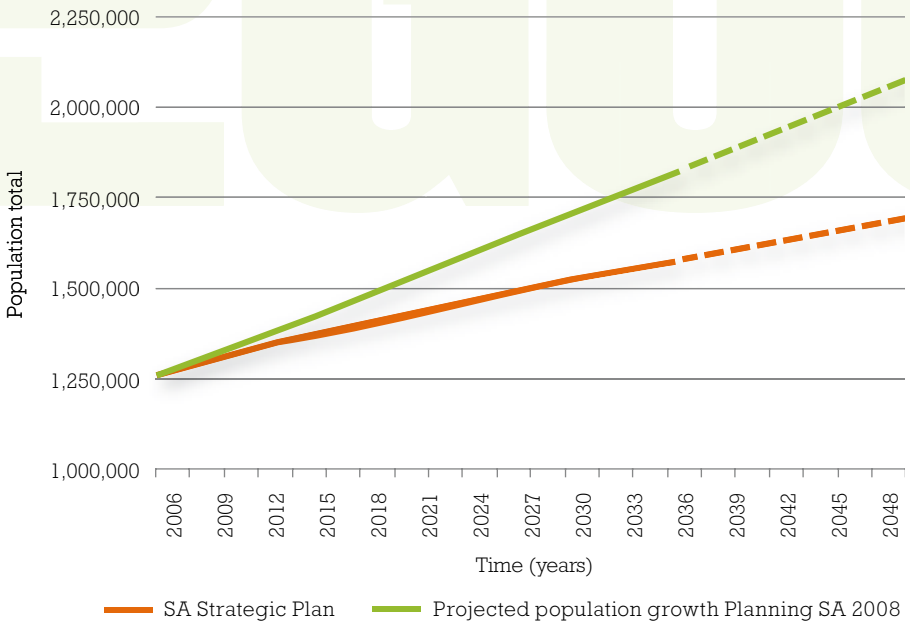
Those responsible for preparing climate change projections insist that they are not predictions. They indicate a range of potential responses by the climate system to plausible scenarios involving future emissions. The scenarios take into account many factors, including economic trends, concentrations of greenhouse gases and their warming effects, and the cooling effects of other pollutants like aerosols.

Scientific confidence in climate models has increased. However, confidence levels vary for different aspects of climate projections. For example, we can be more certain about projected temperatures than we can about rainfall projections.

The various scenarios modelled by the IPCC are explained in Box 1. In the modelling of future demand and supply for Greater Adelaide for the purposes of this Plan, both A2 and B2 have been used. As regional water demand and supply plans are prepared across the State the same IPCC models will be used, unless new and better information becomes available.

The IPCC's emissions scenarios relate to human behaviour and the range of projected temperature changes. The A1F1 fossil intensive behaviour scenario is closely aligned with current human behaviour.

Figure 17
Projected population growth for Greater Adelaide to 2050
Source: Planning SA projections, 2008.



Box 1: Emissions scenarios of the IPCC Special Report on Emissions Scenarios

A1 The A1 storyline and scenario family describes a future world of very rapid economic growth, global population that peaks in mid-century and declines thereafter, and the rapid introduction of new and more efficient technologies. Major underlying themes are convergence among regions, capacity building and increased cultural and social interactions, with a substantial reduction in regional differences in per capita income. The A1 scenario family develops into three groups that describe alternative directions of technological change in the energy system. The three A1 groups are distinguished by their technological emphasis: fossil intensive (A1F1), non-fossil energy sources (A1T), or a balance across all sources (A1B) (where balanced is defined as not relying too heavily on one particular energy source, on the assumption that similar improvement rates apply to all energy supply and end-use technologies).

A2 The A2 storyline and scenario family describes a very heterogeneous world. The underlying theme is self-reliance and preservation of local identities. Fertility patterns across regions converge very slowly, which results in continuously increasing population. Economic development is primarily regionally oriented and per capita economic growth and technological change more fragmented and slower than other storylines.

B1 The B1 storyline and scenario family describes a convergent world with the same global population, that peaks in mid-century and declines thereafter, as in the A1 storyline, but with rapid change in economic structures toward a service and information economy, with reductions in material intensity and the introduction of clean and resource-efficient technologies. The emphasis is on global solutions to economic, social and environmental sustainability, including improved equity, but without additional climate initiatives.

B2 The B2 storyline and scenario family describes a world in which the emphasis is on local solutions to economic, social and environmental sustainability. It is a world with continuously increasing global population, at a rate lower than A2, intermediate levels of economic development, and less rapid and more diverse technological change than in the A1 and B1 storylines. While the scenario is also oriented towards environmental protection and social equity, it focuses on local and regional levels.

Between now and 2030, there is little difference between the impacts on climate of the various emission scenarios described by the IPCC (Box 1). However, for the planning period 2030-2100, the impact becomes more severe. For long-term planning, such as for **Water for Good**, which sets the basis of a plan to 2050, it is essential that we clearly understand the impact of the different emissions scenarios. All suggest an additional increase in global warming of approximately 1°C over the next 20 years (to 2030). Looking out to 2100, current human behaviour patterns at or above the IPCC A1FI 'fossil intensive' and high growth scenario, are likely to result in additional warming of between 2.5°C and 6.5°C, with a best estimate of 4°C.

The IPCC has shown that by 2030, global temperatures may rise by 0.75°C compared with the year 2000. This is in addition to the approximately 0.75°C increase we have experienced over the past century.

The CSIRO has also undertaken work on the likely impacts of climate change on South Australia. All models assessed by the CSIRO show warming across the State. The frequency of extreme maximum temperatures is projected to increase, while the frequency of extreme minimum temperatures is projected to decrease. Hot spells – three or more days above 35°C and 40°C – are projected to increase across all regions except the South East and Kangaroo Island. By 2070, the number of days above 35°C in Adelaide could increase from 14 to between 17 and 38, and the number of days above 40°C, from one to between two and eleven.

The impact of climate change will vary across the State, with inland or northern areas, such as the Alinytjara Wilurara and South Australian Arid Lands Natural Resources Management (NRM) regions, showing annual warming between 0.5°C and 1.5°C by 2030, and between 1.2°C and 4.7°C by 2070. Coastal or southern regions – including the Adelaide and Mount Lofty Ranges, Eyre Peninsula, Kangaroo Island, Northern and Yorke, SA Murray-Darling Basin and South East NRM regions – show warming between 0.3°C and 1.3°C by 2030, and between 0.6°C and 3.8°C by 2070.

Agriculture, natural ecosystems and water resources are likely to be significantly affected if rainfall declines. While the models do not produce consistent results, general increases in rainfall are only indicated in the northern regions. In southern agricultural areas, annual rainfall is projected to decrease by up to eight or nine per cent in 2030, and up to 25 or 30 per cent in 2070. The strongest effect is indicated for spring. Across the southern agricultural regions, indications are that spring rainfall could decline by up to 20 per cent by 2030, and 60 per cent by 2070. Increased evaporation is also expected and this would put stress on surface water resources. The prospect of a drier climate throughout the Murray-Darling Basin and a reduction in flows to the River Murray as a consequence has profound implications.

The CSIRO research also shows that, despite drier average conditions, periodic heavy rainfall events could result in increased flood risks.

In summary, climate change has the potential to affect water availability across the nation by causing:

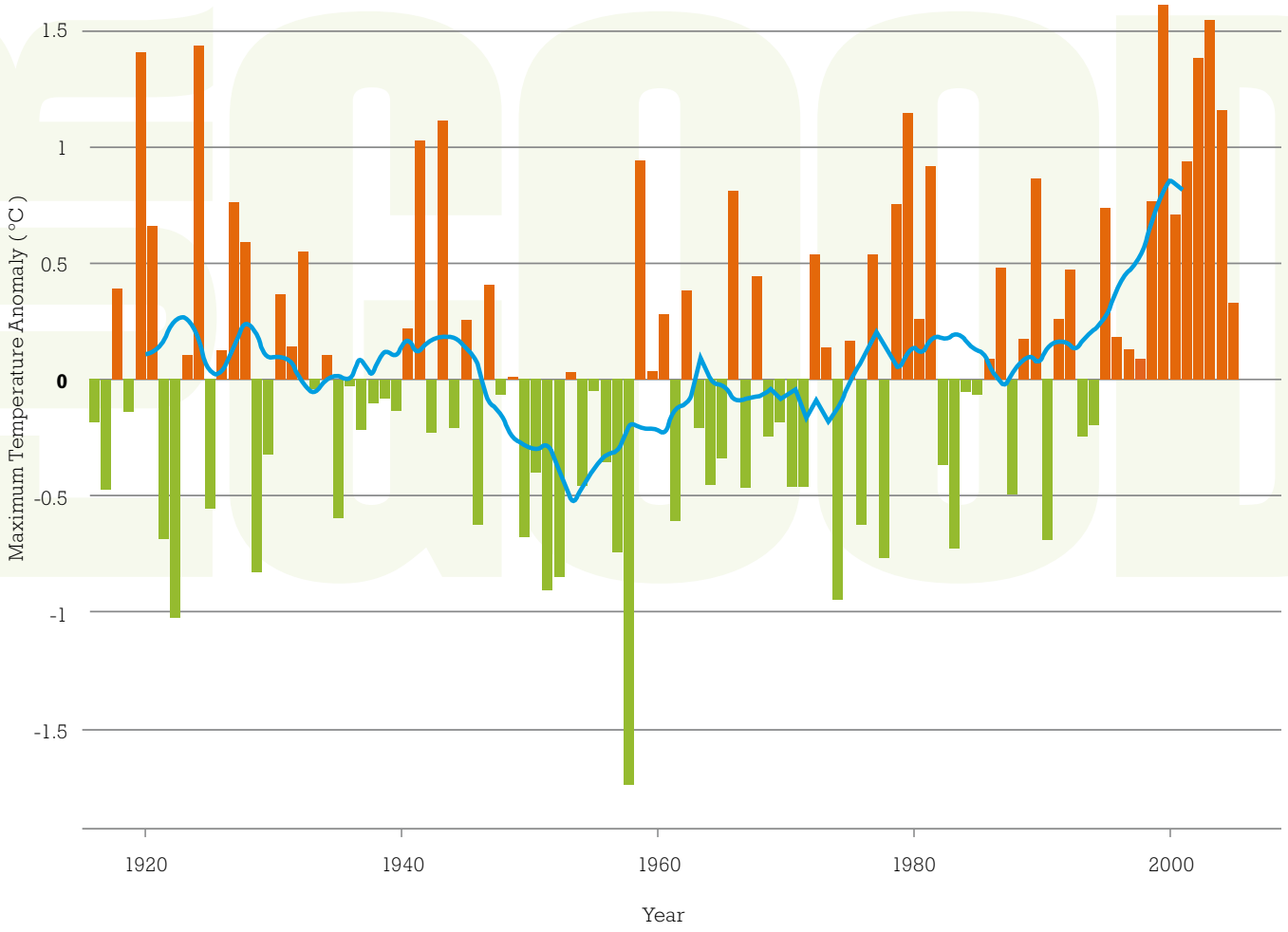
- a reduction in the amount of surface water that can be captured; and less rain to recharge groundwater
- an increase in temperatures, which could lead to an increase in demand
- a rise in sea levels, which could lead to increased salinity in surface and groundwater and the inundation of coastal freshwater wetlands and lowlands
- alteration in the frequency and severity of storm events, which could lead to flooding and have an impact on water quality.

Specifically, in southern South Australia (including the Greater Adelaide region), the impacts of climate change are likely to include:

- increasing temperatures, which could mean more hot days, impacts from heat islands, and fewer cold nights
- increasing severity and frequency of storm events, which could mean more flash flooding
- possible rises in sea levels which could affect coastal areas and their natural and built infrastructure.

Figure 18 shows that, since 1920 there has been an increase of approximately 1°C in mean temperature in the Murray-Darling Basin. Increasing average temperatures, regardless of any other climate change impact, will drive higher evaporation rates, reducing the amount of water retained in surface and groundwater systems.

Figure 18
The nature of climate variability over 100 years, and the increase in temperature experienced in recent decades
Source: Australian Bureau of Meteorology – website www.bom.gov.au



11-year running averages shown by curve. Based on 30-year climatology (1961-90)

The increase in temperature is the result of the greenhouse effect, which is discussed in more detail in Box 2.

Climate change is also expected to have an impact on historic rainfall cycles – increasing the frequency and severity of drought.

South Australian annual rainfall trends since 1900 have been generally weaker than those in other parts of the continent. Much of the northern half of the State became wetter, while southern coastal regions became drier. Annual and seasonal rainfall shows fluctuations on multi-decadal time scales. The 1920s and 1960s were dry decades, while the 1970s were wet. Decadal fluctuations in annual rainfall are dominated by summer and spring rainfall fluctuations. Winter rainfall shows no trend, with weak year-to-year variability. Rainfall in autumn shows year-to-year variability that is greater in the second half of the century.

Looking forward, average rainfall is expected to decline by at least 15 per cent by 2050. The impact on inflows, however, is likely to be much greater. Already a step-change in inflows has been evident in both the Mount Lofty Ranges reservoirs and Murray-Darling Basin since 1997, as discussed on page 48.

Box 2: What is the Greenhouse Effect?

Greenhouse gases such as carbon dioxide (CO_2), water vapour and methane (CH_4) in the air closest to the Earth's surface absorb outgoing radiant heat. Some of the warmth is radiated back downwards to warm the surface of the Earth. This natural phenomenon is known as the 'greenhouse effect'.

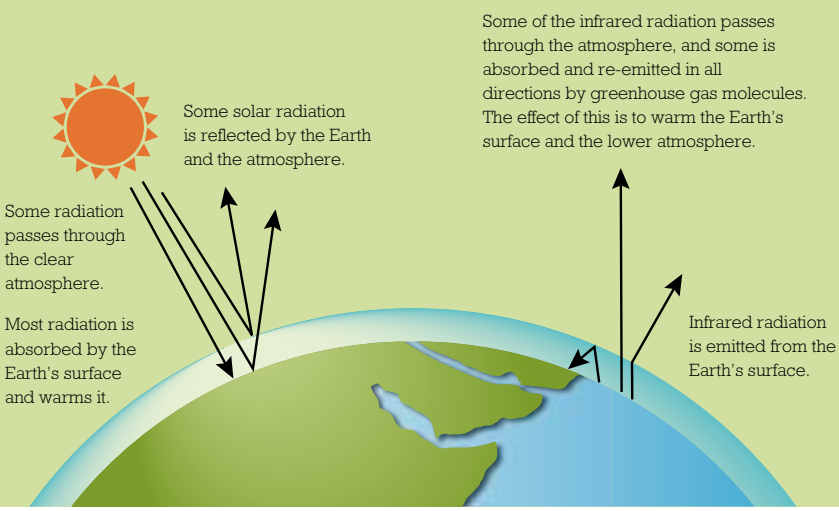
However, a human-driven increase in the proportion of greenhouse gases in the air is enhancing the greenhouse effect. More energy is being absorbed from the Sun than our planet reflects back to space. As a result, the Earth's atmosphere and surface is warming, increasing this effect.

We know that atmospheric concentrations of these gases have increased. The primary cause is the burning of fossil fuels and emissions from land clearing. Humans have had most impact on the enhanced greenhouse effect through increases in the amounts of carbon dioxide, methane and nitrous oxide.

An increasing body of scientific observations gives a collective picture of a warming world and other changes in the climate system. Average surface temperatures have increased over the past 140 years. Records from around the world going back 150 years suggest that 19 of the 20 warmest years have occurred since 1980, and four of these have been in the past seven years. Extreme weather events are becoming more frequent: glaciers are melting; sea ice and snow cover are declining; and animals and plants are responding to an earlier spring.

Scientists project that the Earth's surface temperatures will warm by 1.4°C to 5.8°C by 2100. This is currently considered plausible, based on international scientific consensus. It is not a precise prediction. However, there is already so much excess carbon dioxide (CO_2) in the atmosphere from our burning of fossil fuels that temperatures are set to rise, and the climate to change, faster than at any other time in our history. This could have potentially devastating impacts.

Sources: Tackling Climate Change in South Australia; Victorian Greenhouse Policy Unit, www.climatechange.sa.gov.au.

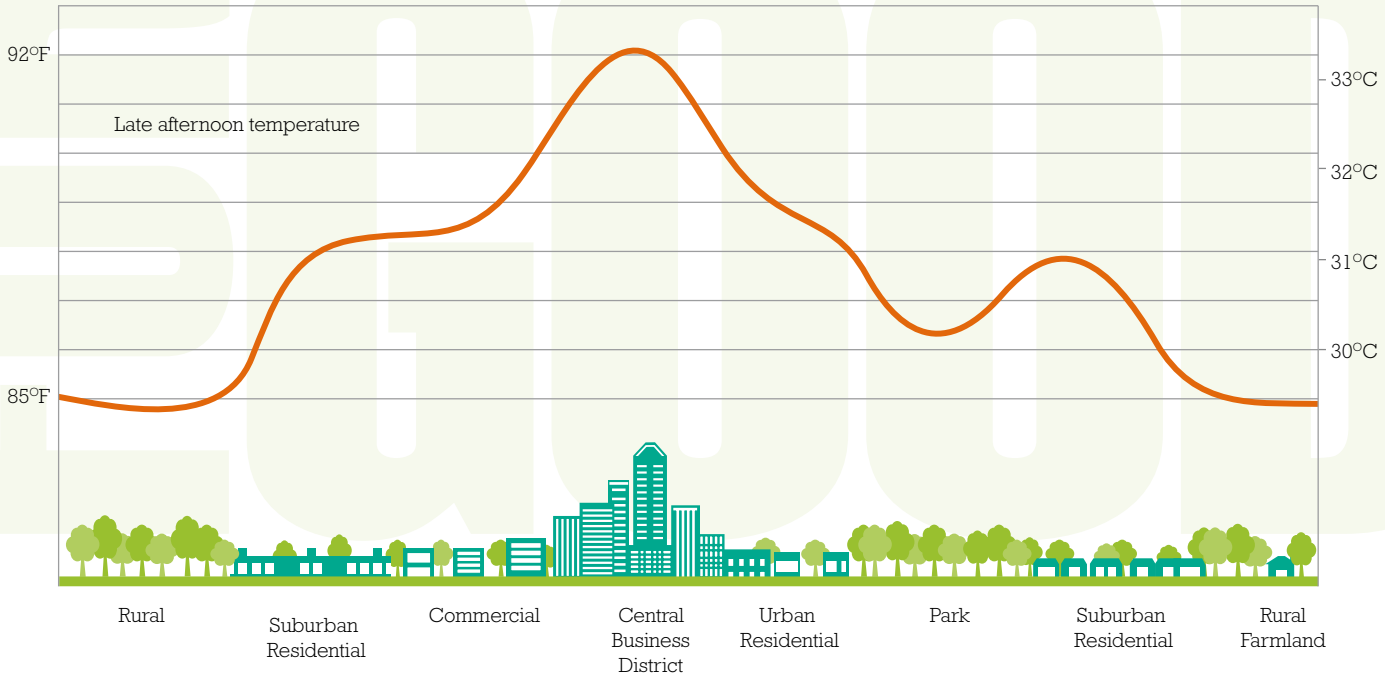


Another anticipated impact is a potential increase in the urban 'heat island effect' – that is, localised warming related to two key factors:

- an increase in the amount of paved and dark coloured surfaces accompanying urban development (e.g. roads, paving and roofs absorbing heat and causing surface and ambient temperatures to rise)
- anthropogenic heat production, such as that produced by car engines and air conditioners.

The higher temperatures that may arise from the heat island effect can be expected to lead to increased water and energy consumption. The effect may be reduced, however, by ensuring there are sufficient 'green' spaces within urban areas, as shown on Figure 19 below.

Figure 19
Sketch of an urban heat island profile
Image sourced from 'Creating Water Sensitive Cities in Australia', presented by Associate Professor Rebekah Brown.



Future demand and supply for Greater Adelaide's mains water

For the purposes of this Plan, demand-supply modelling has been developed for the Greater Adelaide region. This is where projected population growth and climate change is expected to have the greatest impact on water demand for South Australia to 2050. Population growth and climate change forecasts used in these projections are consistent with those in the *Plan for Greater Adelaide*.

Demand and supply forecasts for the remainder of South Australia will be determined as regional water demand and supply plans are prepared.

The conditions have been modelled by KPMG and developed from data provided by SA Water. They are intended to illustrate the possible water demand and supply levels in any given year – depending on population, climate change, possible inflows, and the additional impacts of mitigation strategies.

The findings demonstrate that population growth and climate change will have the greatest impact on Greater Adelaide's future water demand and supply until 2050, and highlight the considerable uncertainty regarding future inflows into the Mount Lofty Ranges reservoirs.

Greater Adelaide's variable water supply

Greater Adelaide has relatively little storage to carry over water from year to year. The region relies on inflows into the Mount Lofty Ranges (MLR) reservoirs and access to adequate flows from the River Murray.

The MLR system does not provide a steady, predictable flow of water. In fact, history shows that inflows to these storages are highly variable. Figure 20 shows the inflows to the Mount Lofty Ranges reservoirs for the period 1892-2006 and demonstrates this wide variability.

In the past 10 years, average inflows into the MLR storages have been 113 GL/a – approximately 36 per cent less than the long-term average of 177 GL/a. Dry flow years have not been interspersed with high flow years, as has been the case historically.

The picture is similar for River Murray inflows in the Murray-Darling Basin. A 49 per cent fall in average inflow has been recorded since 1996-97.

Figure 21 shows the inflows into the River Murray System from 2006-2008 and the average historical inflows.

Balancing demand and supply

To show Greater Adelaide's possible water demand and supply needs to 2050, a set of assumptions were used to determine impacts from population growth, rainfall variability and climate change. The graphs offer a range of possible futures. These futures can inform decisions about further demand management and supply augmentation options.

Figure 20

Annual inflows to the Mount Lofty Ranges reservoirs for the period 1892-2006

Source: Tonkin Consulting (May 2007) MAWSS Stage 1 investigation, SA Water 2009.

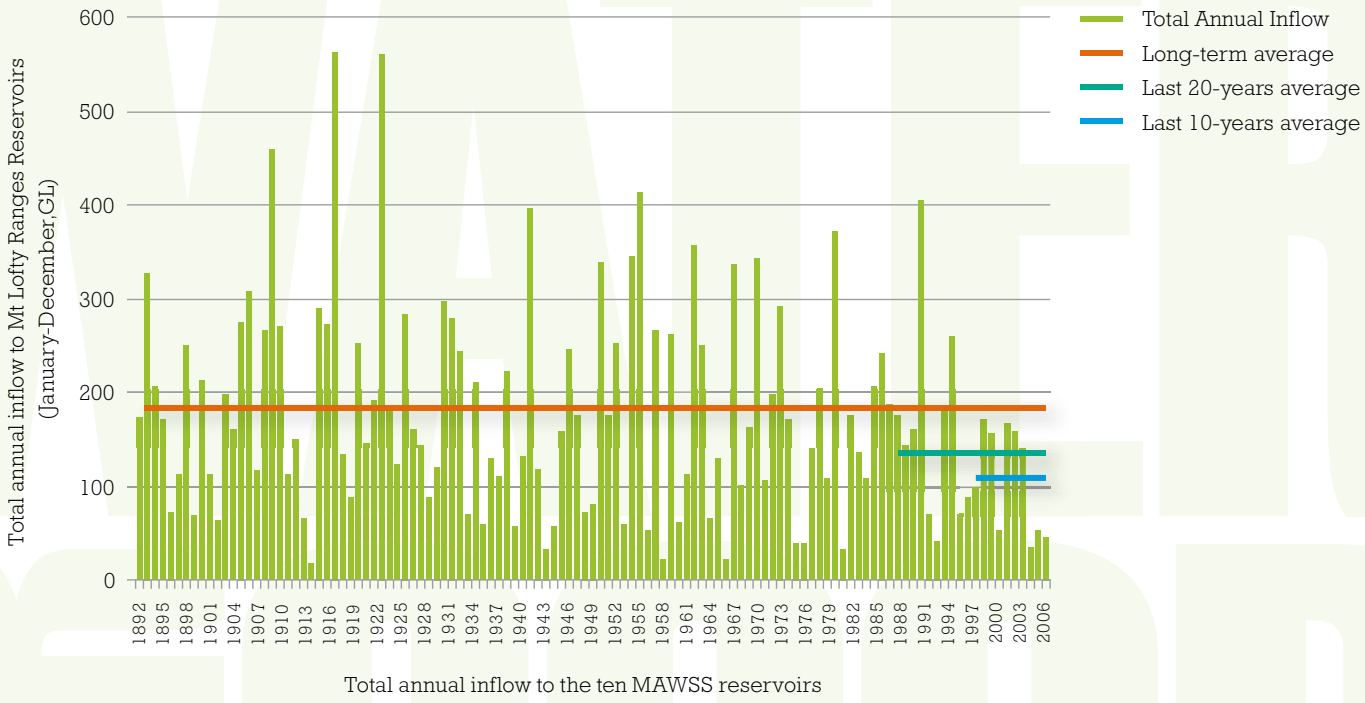
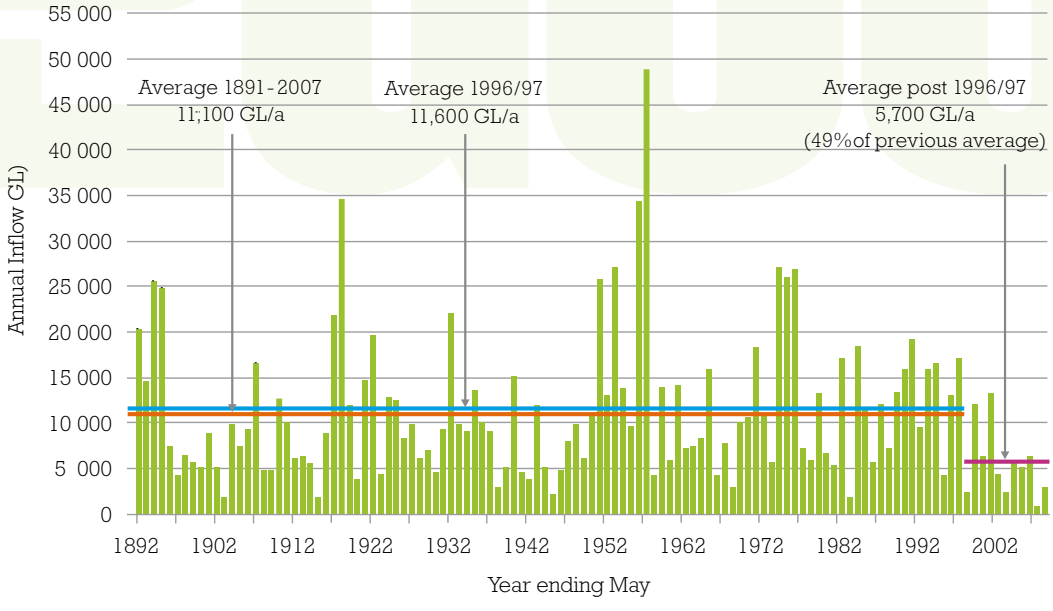


Figure 21

River Murray System inflows

Source: Murray-Darling Basin Commission, June 2008



Possible water futures for Greater Adelaide with no further action

Figure 22 shows the demand and supply balance for Greater Adelaide, under two different possible inflow events, with no additional water security measures taken. Table 3 provides the set of assumptions used for Figure 22.

Figure 22 shows the likely surplus or deficit of mains water in any given year from 2008 to 2050, if no further actions are taken to safeguard Greater Adelaide's mains water demand and supply balance.

Moderate dry year event
The orange line shows what would occur in any given year, with yields from the MLR storages (equivalent to 35 GL a year), gradually reduced by climate change impacts over the next 40 years.

On the basis of the historical record, there is a one in ten chance of this occurring in any given year over the period. Under climate change, this one in ten event may occur more frequently. If this level of reduced flows occurred in any year after 2038, there would be a deficit of supply against demand.

Extreme dry year event
The pink line shows what would occur in any given year with yields from the MLR storages equivalent to 18 GL per annum, gradually reduced by climate change impacts over the period to 2050. This event is similar to yields experienced in the MLR during 2006.

On the basis of the historical record, there is a one in fifty chance of this occurring in any given year, and under climate change predictions this event may occur more frequently. There would be a deficit of supply against demand in any year where this occurred after 2029.

Figure 22
Water availability in any given year under moderate and extreme dry year events with no action

Table 3
Assumptions for Figure 22 – Water availability in any given year under moderate and extreme dry years, with no additional water security measures

Assumptions		
	Moderate dry year event	Extreme dry year event
Supply	A 1-in-10 dry year, equivalent to available flows in the MLR of 35 GL/a in that year, and climate change impacts representing a gradual 41% reduction in yield. Inclusion of 100 GL/a desalination from the beginning of 2013	A 1-in-50 dry year, equivalent to available flows in the MLR of 18 GL/a in that year, and climate change impacts representing a gradual 41% reduction in yield. Inclusion of 100 GL/a desalination from the beginning of 2013
Demand	*Plan for Greater Adelaide* projected population growth of 2 million by 2050 50 GL/a savings from *Water Proofing Adelaide*, including Permanent Conservation measures Increased demands from IPCC B2 trend for estimated changes in temperature and evaporation	*Plan for Greater Adelaide* projected population growth of 2 million by 2050 50 GL/a savings from *Water Proofing Adelaide*, including Permanent Conservation measures Increased demands from IPCC A2 (higher than B2) trend for estimated changes in temperature and evaporation
Outcome	Supply remains in surplus to 2038, falling to 32 GL/a in deficit in 2050.	Supply remains in surplus to 2029, falling to 68 GL/a in deficit in 2050.

Figure 23
Water availability in any given year under moderate and extreme dry years, with additional water security measures as outlined in WFG

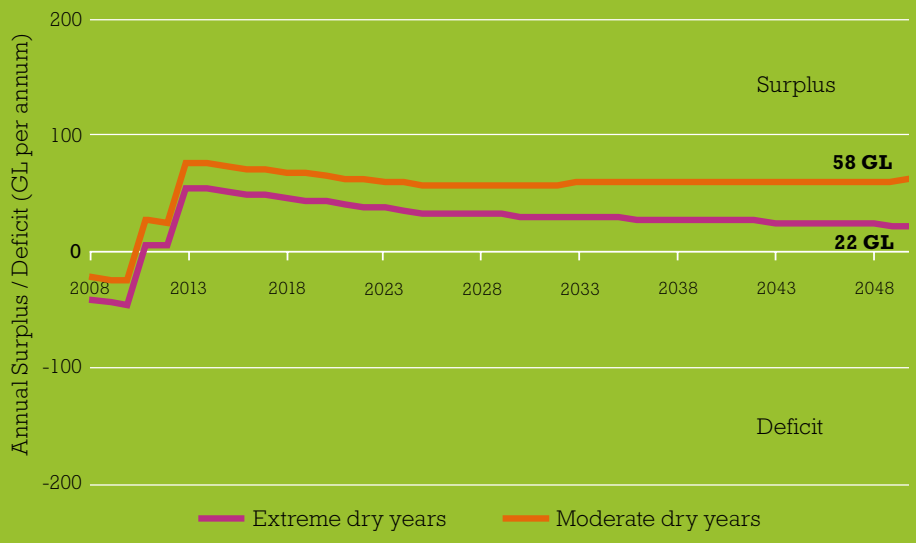


Table 4
Assumptions for Figure 23 - Water availability in any given year under moderate and extreme dry years, with additional water security measures

Assumptions	
Supply	As in Table 3, but including: • At least an additional 40 GL from alternative supplies between 2025 and 2050 under both the moderate and extreme dry year events
Demand	As in Table 3, but including: • Additional demand mitigation target of 50 GL/a in savings by 2050
Outcome	Supply remains in surplus for all years to 2050 under both the moderate and extreme dry year events. In 2050 this surplus is 22 GL/a under an extreme dry year and 58 GL/a under a moderate dry year.

For both events the surplus or deficit is expected to be equivalent to the volume shown in the graph for that year. For example, if a one-in-50 year rainfall event occurred in 2029 the shortfall would be nearly zero. If, however, a one-in-50 year event occurred in 2050 without further action to secure Greater Adelaide's water supply, the shortfall would be 68 GL, or around one-third of Greater Adelaide's current total water consumption.

This means that without further action, Greater Adelaide could experience water shortages from 2029 onwards in dry years, even with the inclusion of the Adelaide Desalination Plant.

Possible water futures for Greater Adelaide with action

Figure 23 shows the demand and supply balance for Greater Adelaide using the inflow events described previously but including the additional demand and supply actions outlined in this Plan. Table 4 provides the set of assumptions used for Figure 23.

This modelling includes water savings through targets for demand mitigation (50 GL per annum) and recycling (40 GL per annum) by 2050, Greater Adelaide's water supply and demand balance remains in surplus beyond 2050 even during one-in-50 year low rainfall events.

Greater Adelaide's likely future supply

The **Water for Good** modelling shows that with actions to be undertaken, Greater Adelaide's mains water supply has a 58 GL surplus until 2050, even in dry years. It assumes that Adelaide still receives its full licence entitlement from the River Murray, and operates the desalination plant at full capacity.

In practice, the unit cost of water from each source would determine the actual supply mix. A future dry-year supply portfolio is shown in Figure 24 below. In this case, reliance on the River Murray is reduced, and the declining and variable yield from the MLR reservoirs is effectively covered by desalination and the increasing use of recycled stormwater and wastewater – the latter for non-drinking uses.

Although Adelaide will reduce reliance on the River Murray through additional diverse supplies, the State will still need its entitlement for River Murray water to:

- supply growing country townships
- control river salinity and water quality
- provide a more secure supply to irrigators
- ensure a healthy riverine environment all the way to the Mouth.

Adaptable framework – planning in a climate of uncertainty

Planning for future supply while there is a high level of uncertainty about key drivers for both supply and demand is complex and requires an adaptive approach.

The State Government has put in place measures to ensure that the water demand and supply needs of Greater Adelaide are met in the short to medium term. Over a longer time horizon, it becomes increasingly difficult to predict with certainty what additional actions might need to be taken. This is illustrated by the different scenarios discussed earlier.

To assist in making timely and appropriate decisions, an adaptive management approach will be developed. It will consider the following factors:

- a set of water security standards
- state of the resource
- demand pressures
- governance and management
- options and assessment process
- measuring and monitoring.

Figure 25 shows the proposed adaptive management framework.

Action

Establish an adaptable management framework, incorporating an annual review process, to assist in making timely and appropriate decisions to provide on-going water security throughout the State.

Water security standards

The Government will set security standards for South Australia's water supplies. These standards will define the risk points that would threaten water supply and require decisions on options to increase supply, or reduce demand, or both. They will be developed based on the following parameters:

- system water quality
- capacity of the supply system
- water source – including diversity, reliability and security
- consumer efficiency
- demand factors – population and economic growth
- climate change scenarios
- environmental requirements
- cost effectiveness
- standard of service
- restrictions – including timing, frequency, severity and duration.

Figure 24

Total water supply available for Greater Adelaide

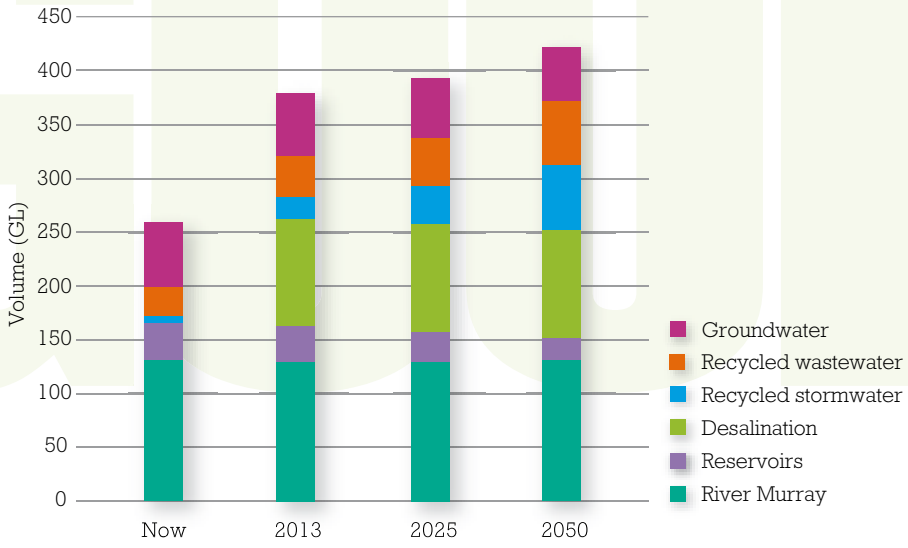
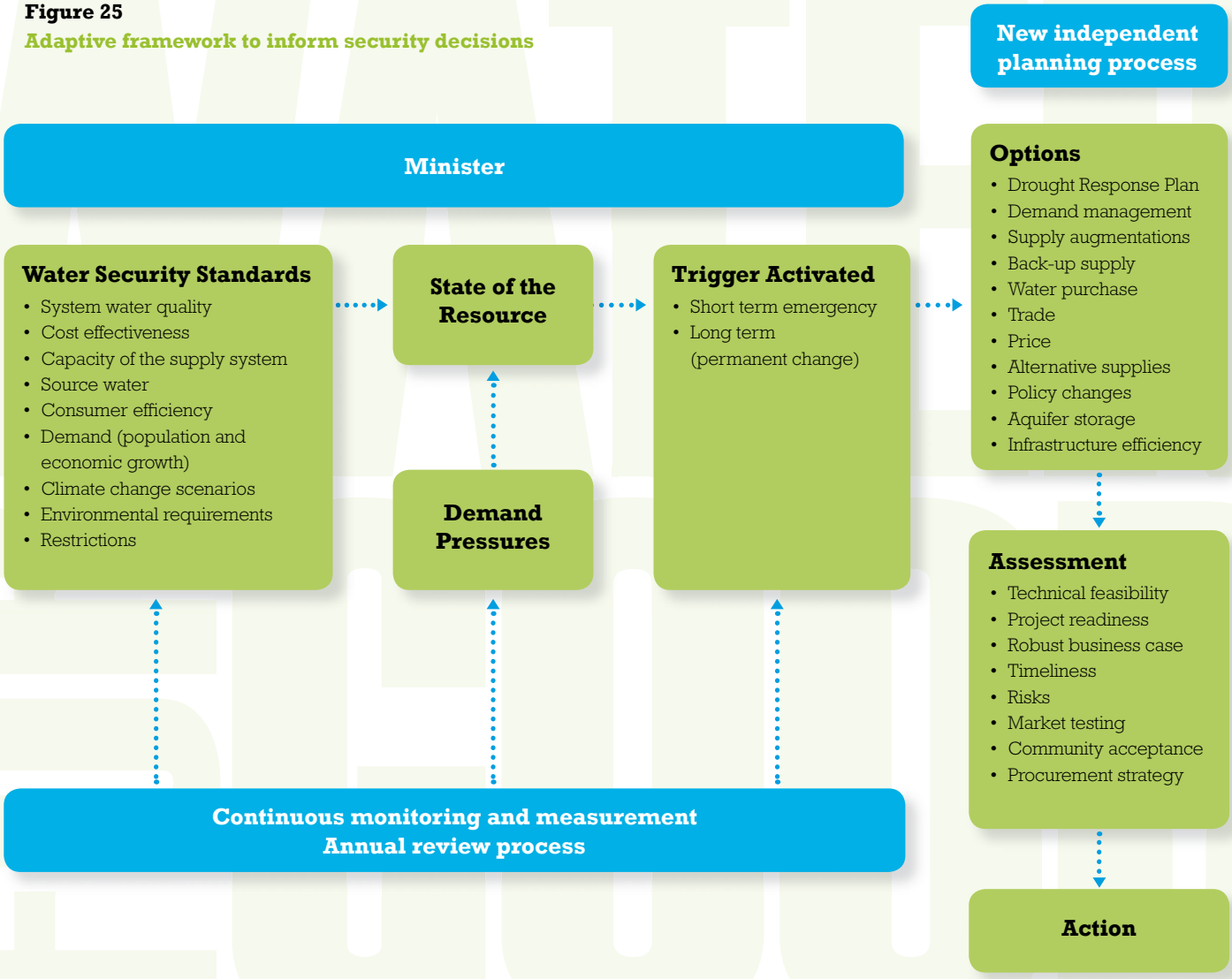


Figure 25
Adaptive framework to inform security decisions



State of the resource and demand pressures

Water security is concerned with managing the risk of having insufficient water to meet demand. It is essential to regularly monitor and measure the state of the resource and demand pressures.

Reviews will take into account the volume and quality of water available from all sources, the impact of climate modelling, the rate of any expected change to the resource, and the impact of short-term effects, such as drought or water quality deterioration.

Estimates of future demand should encompass all uses, including those for economic development, social, environmental and cultural purposes. Input from government agencies and the community will be important in achieving this.

An annual review process provides an important checkpoint for significant investment decisions and can improve the cost effectiveness of projects. Frequent reviews are particularly important in the water industry as significant lead times are often required to design and construct infrastructure to deal with demand and supply imbalances.

This Plan will be reviewed annually, beginning in 2010. The review process will assess the state of all the resources against the water security standards, and update demand and supply forecasts. It will identify issues affecting the future security and reliability of the State's water supply system, relative to forecast demand.

Action

The Minister will produce an annual statement that will:

- assess progress of the Plan and identify any risks or issues
- review and confirm water security standards for the upcoming review period
- provide demand-supply status for each region
- identify and analyse impacts of any emerging issues.

Trigger points

All actions relating to future demand and supply will have economic, social and environmental costs and benefits. Our objective must be to find effective strategies which strike an acceptable balance. In an adaptive management framework, trigger points help to ensure that decisions are cost-effective and timely. In particular, triggers:

- reduce risk and identify opportunities
- encourage a large range of innovative options
- reduce the risk of making high-cost investments that prove to be redundant, or are delivered earlier than needed
- ensure that demand and supply is continually monitored.

Triggers are used elsewhere in Australia, including in New South Wales. South Australia, however, has a more complex water resource system to manage than other jurisdictions. The reasons for this include:

- no climate independent sources of water in the system until 2010
- storages located interstate (along the River Murray) as well as locally
- limited local resources, and storage capacity adequate for short periods only (equivalent to 12 months supply)
- high dependence on the River Murray, which is over-allocated and vulnerable to drought and climate change.

In using triggers as part of an adaptive management approach, it is important to distinguish between medium-to-long-term planning and drought or emergency responses (required as a result of natural disasters, operational failure or water quality issues). Drought and emergency response plans will always need to be in place but are likely to be short-term mandatory or voluntary measures to manage demand and supply. Once the situation that triggered the response is over, these measures are usually no longer required. Water restrictions are an example of a mandatory measure used in this way. See Table 5 for some examples of triggers.

To underpin the adaptive framework, a model is needed to clearly show the trigger points and timeframes for decisions.

Table 5
Examples of triggers

Demand triggers	Supply triggers
Population drivers	State of the resource
Gross, character, location	Amount/quality
Consumption	New information and science
Yield requirements to meet growth	Climate modelling
Policy changes	Rate of change
MDB Cap	Demand
Changes to Water Allocation Plans	Competing demand
Change in security	Infrastructure
Population policy changes	Unforeseen permanent events
Economic policy	Demand management
Environmental policy	Technology advances
Land use changes	Augmentation options
Industry	Alternative supplies
Knowledge and science	Treatment technologies

Monitoring and measurement

Each year, reviews of **Water for Good** and regional water demand and supply plans will be undertaken to check both the status of resources and the assumptions on which the plans are based. A monitoring and measurement framework will be developed to assist with decision-making and annual reporting.

It will include a set of water accounts for all water sources in the State, and a model that enables timely and accurate projections of demand and supply under different scenarios.

Options and assessment

The approach to determining the best water security solutions and meeting future demand and supply imbalances should include:

- ensuring that all options are on the table
- developing a rolling multi-year program of options (capital and non-capital) that have been developed to feasibility stage and independently assessed
- developing robust and repeatable assessment criteria, including estimated capital and operating costs, water prices, the volume of water (either saved or supplied or both), the risk profile, and social, economic and environmental impacts
- assessing the level of flexibility inherent in each option, such as timing, scale, lead times required, and scope for deferring or stopping to avoid costs
- assessing the readiness of the option within a short, medium or long-term timeframe.
- building understanding and knowledge through best practice, research and development, and interstate and international comparisons. It will be vital to ensure that relevant technological advancements are continually considered
- building organisational capability for the rapid roll-out of options
- reviewing the option portfolio annually, and in line with the State Budget process.

Independent planning process

As discussed, a range of factors influence decision making about supply augmentation options for particular circumstances. They include timeframes to plan and implement, volume required and the immediate and ongoing costs.

The Government will receive independent advice on these matters, through the establishment of an independent planning body if the demand supply forecasts indicate that further action is needed.

The planning body will recommend options to be implemented so that Water Supply Standards can be maintained.

This advice will ensure decisions about augmentations will be transparent and timely and result in efficient and innovative solutions.

Action
The Minister will establish an independent planning process if demand and supply forecasts indicate a gap is likely to exist in the foreseeable future.

Rainfall, rivers, reservoirs and aquifers do more than just provide drinking water, sustain agriculture and industry, and support recreation, tourism and cultural opportunities. These resources are also valuable environmental assets that support critical plant and animal ecosystems.

Part 4

Managing our water future

Rain, rivers, reservoirs and aquifers

Part 4
Managing our water future

Introduction

The South Australian Government's response to water security includes desalination, using water efficiently, water recycling and catchment management. **Water for Good** builds on this.

Desalination will be an important means of diversifying Greater Adelaide's water supply because it will reduce our dependence on rainfall. It is also the best solution for a number of regional centres where existing water supplies are declining, or where salinity levels exceed drinking water guidelines.

Recycling, too, will become an increasingly significant and effective means of diversifying supply, and it has the added benefit of helping to protect our estuarine and coastal waters by reducing the amount of polluted water that flows out to sea. The best opportunity for recycling appears to be in new residential developments, where harvested stormwater can be supplied for non-potable use to homes, open spaces and nearby industries.

Traditionally, stormwater management has been a local government responsibility. The South Australian and Commonwealth Governments will continue to partner with local government to provide funding and help develop new schemes.

South Australia is well advanced in the use of recycled wastewater for irrigation. This water is used for horticultural activities in Greater Adelaide as well as for open space and garden watering in metropolitan and regional areas.

Saving water will be the main message in a post-water restriction era. A high uptake of water-saving devices in homes and industry is expected to ensure an overall, sustained reduction in water use. Education and the encouragement of innovation will lead to increased development and uptake of new water-efficient products.

Protecting our rivers, reservoirs and aquifers is vital if we are to sustain them, and this will continue to be the focus for catchment management. We must also improve our knowledge of the current state of our surface and groundwater resources, as well as our ability to understand the potential impacts of climate change.

Quick fact:
A catchment is an area where water is collected by the natural landscape, such as hills or mountains, from which all rain and run-off water flows to a low point – like rain on a roof flowing to a downpipe. In a catchment, all rain and run-off water eventually flows to a creek, river, lake or ocean, or seeps into the ground and then to the aquifers and underground basins that make up the groundwater system.

Rain, rivers, reservoirs and aquifers

Key points

- To sustain the health of rivers, aquifers, creeks and reservoirs, it is critical that sufficient water be allocated for the environment
- Modelling indicates that the Mount Lofty Ranges and the Murray-Darling Basin average annual catchment yield could reduce by up to 41 per cent and 30 per cent, respectively, due to climate change, by 2050. There will also be greater risk of bushfires
- Climate variability can have significant adverse impacts on water quality and quantity
- The Murray-Darling Basin is being severely degraded by record low inflows
- Groundwater catchments across the State are threatened by land use changes and lack of recharge
- Groundwater and surface water catchments that are not prescribed should be monitored to ensure appropriate and timely management action is taken
- Public health is the paramount consideration for managing drinking water quality, therefore drinking water systems must have, and continuously maintain, robust multiple barriers to potential contamination
- Effective management of water catchments fosters optimum water supplies
- The establishment of 'community agreed' values and uses of water bodies is critical for effective, targeted management.

Actions and outcomes

Outcome

The entire length of the River Murray is a healthy, working waterway that continues to provide critical human needs water for Adelaide and regional South Australia, irrigation requirements and water for the environment.

Actions under way

Work with the Murray-Darling Basin Authority and other Basin jurisdictions to ensure a healthy, working River Murray that will continue to provide critical human water needs for Greater Adelaide and regional South Australia, irrigation requirements and water for the environment. Specifically, by seeking:

- a Basin Plan that incorporates appropriate 'end-of system' objectives, targets and actions by returning the River Murray to sustainable levels of extraction
- a Basin Plan that establishes a permanent system of environmental flows for the River Murray and Lower Lakes, including management of unregulated flows and salinity
- improved arrangements for risk management, storage, delivery of and accounting for water
- reviewing and improving river operations, particularly river operating strategies and rules, to ensure more effective, efficient and transparent distribution of South Australia's water entitlement

Complete, on time, the elements of the *Murray Futures* program designed to sustain, support and reinvigorate communities and industries within the Murray-Darling Basin in South Australia

Undertake real-time management of environmental issues and potential risks affecting the Lower Lakes

Maintain a positive balance on the Murray-Darling Basin Salinity Register, and continue to implement strategies and actions to ensure the real-time management of salinity in the lower reaches of the River Murray so that water quality remains at levels suitable for human consumption

Explore the economic and environmental feasibility of using saline water produced in salinity management schemes

As a last resort, build a temporary weir at Pomanda Island to protect the water supply to the 1.2 million people currently receiving it from the River Murray below Lock 1. The temporary weir would only be constructed if inflows remain at critically low levels and agreed triggers for acidification or salinity were activated and could not otherwise be prevented.

Outcome

All of South Australia's natural water resources – surface, ground and watercourses – are managed within sustainable limits.

New actions

Commission, where required, regional-scale studies on the impacts of climate change on water resources

Adopt a two-staged approach to water allocation planning, with an Interim Water Allocation Plan followed by a Comprehensive Water Allocation Plan for all newly prescribed areas

Provide funding of $8.6 million over 2 years (2009-10 and 2010-11), to strategically review and, where required, expand or upgrade the water resources monitoring network

Increase regularity of statewide data collation, assessment and reporting, where required

Implement a statewide policy framework for managing the water resource impacts of plantation forests, and amend the *Natural Resources Management Act 2004* to allow forest water licensing, where appropriate, consistent with the statewide policy framework

Require mining ventures to provide their own water supplies within the sustainable framework of natural resources management planning, and regional water demand and supply plans.

Actions under way

Complete Water Allocation Plans and regulatory review of Water Allocation Plans for key areas, in the Mount Lofty Ranges, the Murray-Darling Basin, the South East and Central Adelaide

Implement SA Water's Fire Recovery Strategy for all reservoirs in the Mount Lofty Ranges catchments

Bring additional water resources into formal management through prescription and water allocation planning, as necessary

Continue programs to unbundle water rights across South Australia and remove barriers to trading water entitlements

Work with the Bureau of Meteorology to develop a Strategic Water Information Plan.

Outcome

Drinking water catchments are adequately protected.

New actions

Develop water quality improvement plans for the Mount Lofty Ranges (MLR) Watershed by 2011 and other critical water catchments across the State by 2017

Establish planning policies, based on the water quality risk hierarchy associated with the MLR Watershed Priority Areas, to ensure that new developments have a beneficial, or at least neutral, impact on water quality in the Watershed

Undertake a comprehensive review of current management and protection of the MLR Watershed with a view to developing an agreed vision, targets and responsibilities for its future management by the end of 2010

Require relevant agencies to report annually on how they are meeting the MLR Watershed targets.

Actions under way

The Environment Protection Authority will develop environmental values for priority water bodies across the State by 2014.

Outcome

Through actions undertaken to secure future water supplies, any further expansion of storage capacity within the Mount Lofty Ranges (MLR) will not be needed until at least 2050. However, our adaptive planning framework will review this option by 2025.

Discussion

Across South Australia, the natural water resources, on which we rely heavily, face a number of threats, all of which are being exacerbated by changes in our climate.

Our largest and most important water supply resources are:

- the River Murray catchment
- the Mount Lofty Ranges drinking water catchments (or Watershed)
- groundwater catchments (particularly in the South East, Eyre Peninsula and northern regions).

For a long time, resource managers have been implementing a range of initiatives to improve the quantity and quality of our water resources. Despite these efforts, flows and water quality continue to deteriorate. It is now recognised that identification and control of risks is integral to the successful management of water resources.

Key threats facing our water resources include:

- climate change, which gives rise to: greater variability and more extreme weather events; changing rainfall patterns; increased evaporation and less run-off; and water quality impacts such as increasing salinity, blue-green algal blooms and new pathogen challenges
- bushfires increasing in frequency and intensity as a result of climate change
- over extraction of both surface and groundwater
- contamination from point source and diffuse pollutants
- development of acid sulfate soils
- increasing salinity
- change in land use, e.g. forestry, mining and increased urbanisation.

These factors can lower catchment yields and water quality, which in turn impacts on the availability and cost of providing water for both human and other uses. Protecting the integrity and sustainability of our natural water resources requires regular monitoring of the health of rivers and aquifers, establishing adaptive water allocation mechanisms, and adopting sound land management practices.

Many of our water resources cross State boundaries. Their effective management therefore requires cooperation and collaboration between governments and land holders. The learning and experiences gained from managing the Murray-Darling Basin should be considered in the management of the State's other water resources, for example, the Great Artesian Basin and groundwater resources in the north-west.

The River Murray

The River Murray and its catchments in South Australia are of special social, cultural, economic and environmental importance. They support significant economic activity based on irrigated and dryland farming and associated food processing.

Environmental degradation throughout much of the river system threatens this vital waterway's health and ongoing productivity. Recent dry conditions have resulted in drastically reduced inflows to South Australia and this is affecting the water available for human uses and leading to a decline in water quality. Graphic examples of the serious nature of this degradation, and the impact of the current extreme conditions, include the exposure of acid sulfate soils around the Lower Lakes and other wetlands along the river, and the high risk of blue green algal outbreaks.

Even before the recent years of low inflows, there was compelling evidence that the health of the Murray's ecosystem was in decline. Deteriorating water quality, loss of native plants, animals, fish and wetlands, and an increase in pests like carp, were all pointing to a river under stress. A range of actions were undertaken to return vital environmental flows to the system including the development of the *Living Murray Initiative*.

Figure 26
Murray-Darling Basin in South Australia

However, climate conditions have exacerbated the threats and it is clear that current levels of extraction throughout the river system cannot be sustained. Many other factors also contribute – the progressive slowing of the river flow as a result of reduced inflows, rising saline groundwater and increasing river salinity.

The future condition of the River Murray will depend on the actions we take now. However, at the very time when significant intervention is needed to improve its health, it faces competing interests such as growing urban demand for water.

The Murray-Darling Basin reforms

Our critical natural water resources, particularly the River Murray, are for the most part shared with other jurisdictions, and we are the downstream State. It is vital that proper national arrangements are in place to ensure the protection of the Murray-Darling Basin, and that is why the South Australian Government sought the establishment of an independent authority to better manage it.

Reform of the Basin's governance and planning arrangements was initiated in 2007 with the passage of the *Water Act 2007*, which established a new Murray-Darling Basin Authority with responsibility for basin-wide planning and management.

At the meeting of the Council of Australian Governments (COAG) on 26 March 2008, the Commonwealth, the Murray-Darling Basin States and the Australian Capital Territory agreed that the former Murray-Darling Basin Commission should be absorbed into the new authority. This agreement was formalised at the 3 July 2008 COAG meeting, and an Intergovernmental Agreement on Murray-Darling Basin Reform was signed.

Through this agreement, for the first time, South Australia has access to the upstream storages of its choice (including Hume and Dartmouth dams) to store water to meet its critical human water needs, and for private carryover. This will allow the State to carry over and store water for delivery in times of low flows. It will also reduce the risk of a major failure in the supply of potable water to South Australia.

The agreement established new governance arrangements, including provision for critical human water needs, comprehensive and consistent trading arrangements across the Basin, and the transition to the new authority.

The creation of the new, independent authority means that, for the first time, a single agency is responsible for planning the integrated management of water resources of the Murray-Darling Basin.

The functions of the authority include:

- preparing a Basin Plan, for adoption by the Commonwealth Minister for Climate Change and Water, which will set sustainable limits on the volume of water that can be taken from surface and groundwater systems across the Basin
- advising the Minister on the accreditation of state water resource plans
- developing a water rights information service to facilitate water trading across the Basin
- measuring and monitoring water resources in the Basin
- gathering information and undertaking research
- implementing and enforcing the Basin Plan
- engaging the community in the management of the Basin's resources.

Mount Lofty Ranges Watershed

The Mount Lofty Ranges (MLR) drinking-water catchments, also known as the MLR Watershed, have historically provided, on average, 60 per cent of metropolitan Adelaide's mains water supplies. They can supply up to 90 per cent in years of abundant rainfall and as little as 10 per cent in times of drought. The MLR Watershed also acts as a conduit to transport and store water from the River Murray.

Managing and protecting the Watershed has become increasingly challenging because:

- 90 per cent of land is privately owned and used for other purposes. (By comparison only 10 per cent of Melbourne's watershed and 20 per cent of Sydney's watershed are privately owned)
- over 55,000 people live and work in towns and on properties within it
- it is used extensively for agriculture, intensive horticulture, recreation, rural living and tourism
- it is made up of highly fragmented rural holdings
- only eight per cent of native vegetation remains, 70 per cent of which is on private land
- only one per cent of the stream network of the Adelaide Hills has been described as being in healthy condition
- the hydraulic function of the rivers and floodplains (storing, releasing and directing flood flows) has been fundamentally altered or completely lost.

Groundwater aquifers

The geology of South Australia supports the storage and movement of groundwater through aquifers. Over time this groundwater has become one of the State's main water resources. It supports economic prosperity through agriculture, mining and rural township use.

Groundwater also contributes towards non drinking water supplies in the Greater Adelaide area. The groundwater underlying the Northern Adelaide Plains, Western Mount Lofty Ranges and Central Adelaide is used for community, industrial and horticultural purposes. Specifically in the Central Adelaide area, groundwater is used by large industries (including breweries, the beverage industry and manufacturing), golf courses and local councils. Potentially, the groundwater in the Central Adelaide area could also be used for emergency drinking water supplies.

Managing and protecting South Australia's groundwater aquifers has become increasingly challenging as:

- climate affects recharge into aquifers, reducing the sustainable volume of water available for use
- declining groundwater levels in coastal aquifers introduces the risk of seawater intrusion
- current groundwater monitoring does not fully cover all water resources, making assessment of their state and condition difficult
- growth in the mining and forestry industries places increasing pressure on groundwater resources
- groundwater-dependent ecosystems, such as the endangered Great Artesian Basin spring ecosystems, are threatened by declining pressure caused by falling water tables.

As South Australia's climate continues to change, our reliance on groundwater resources will increase. The future health of our aquifers partly depends on the actions we take now to address these challenges.

Despite our efforts of over many years, flows into, and quality of, the water in some of these catchments have continued to deteriorate. It is now recognised that identification and control of risks is integral to the successful management of water resources.

How we will manage our rivers, reservoirs and aquifers

The River Murray

Basin Plan

A healthy River Murray is essential to maintain the system's ecology as well as water quality for productive use. The best scientific advice consistently states that additional flow in the river is required to restore it to good health. In 2003, the Scientific Reference Panel for the Murray Darling Basin Commission advised that, on a whole-of-river scale and based on the level of development that existed at that time, an additional 1500 GL per year was required to deliver a moderate improvement in river health.

Progress has been made, through the *Living Murray Initiative*, to return 500 GL of water to the environment by 2009. South Australia is the first jurisdiction to meet its part of this agreement by securing 35 GL of water for River Murray environmental purposes. Under *Water for the Future*, the Commonwealth Government has committed $3.1 billion to purchase water in the Murray-Darling Basin over 10 years, and has established the Commonwealth Environmental Water Holder to manage the water entitlements that the Commonwealth acquires. Water is also being recovered through improvements in irrigation infrastructure and water use efficiencies.

However, water purchase and recovery of water from users are only part of the solution. Unregulated flows (surplus flows) that cannot be captured and controlled by Murray-Darling Basin Authority-controlled storages and infrastructure, need to be collectively managed and accounted for, to protect the environment. In addition, land management activities such as afforestation, groundwater extraction and farm dams that can significantly reduce surface water flows into the River Murray system need to be managed across the basin. Action to improve river flows must also be complemented by action to control salinity and other water quality issues. These issues must be addressed in an integrated way across the entire basin.

The state of water quality (salinity levels and ecological health of the lower reaches of the River Murray including but not limited to significant ecological assets such as the Coorong and Lower Lakes RAMSAR wetlands) provide obvious indicators for success or failure in managing the water resources of the Murray-Darling Basin.

The South Australian Government will continue to participate proactively in the new governance and planning arrangements and will advocate for integrated management approaches and for 'end-of-system' management objectives and targets to be set for the Murray-Darling Basin. This is vital to ensuring sustainable river health throughout the whole system.

Action

Work with the new Murray-Darling Basin Authority and other Basin jurisdictions to ensure a healthy, working River Murray that will continue to provide critical human water needs for Greater Adelaide and regional South Australia, irrigation requirements and water for the environment. Specifically, by seeking:

- a Basin Plan that incorporates appropriate 'end-of system' objectives, targets and actions by returning the River Murray to sustainable levels of extraction
- a Basin Plan that establishes a permanent system of environmental flows for the River Murray and Lower Lakes, including management of unregulated flows and salinity.

Critical water needs

The River Murray will continue to be an essential component of South Australia's **Water for Good** Plan. While the benefits of past arrangements are recognised, new approaches are now required to address the pressures of climate change and climate variability.

The States' referral to the Commonwealth of powers over water management in the Murray-Darling Basin means that the Basin Plan will contain arrangements for meeting critical human water needs for those communities dependent on the River Murray system. Complementary changes will be made to the Murray-Darling Basin Agreement to introduce a three-tiered system for sharing water in the system, and its key tributaries, to ensure critical human water needs can be met under dry and extreme drought conditions, and to enable South Australia to store water upstream. South Australia's water needs will have to be clearly understood and taken into account in the development of the Basin Plan, and in any review and amendment of the Murray-Darling Basin Agreement. The South Australian Government will continue to negotiate through these new arrangements to ensure appropriate water quality and quantity for the State's requirements and to provide greater certainty for ensuring critical human water needs can be met.

South Australia has always had a conservative approach to the allocation of water from the River Murray for irrigation. With the exception of the current extreme drought conditions our irrigators have enjoyed the highest security of supply in the Basin. South Australia will aim to restore this level of security even at times of extreme drought through our work at the national level and through our work with the Murray-Darling Basin Authority.

Action

Work with the Murray-Darling Basin Authority and other Basin jurisdictions to ensure a healthy, working River Murray that will continue to provide critical human water needs for Greater Adelaide and regional South Australia, irrigation requirements and water for the environment. Specifically, by seeking:

- improved arrangements for risk management, storage, delivery of and accounting for water
- reviewing and improving river operations, particularly river operating strategies and rules, to ensure more effective, efficient and transparent distribution of South Australia's water entitlement.

Murray Futures

Murray Futures is a South Australian Government initiative to manage the River Murray from the Murray Mouth to the Victorian border. Funded by the Commonwealth Governments' $12.9 billion *Water for the Future* program, it will secure future water supplies, renew industries and communities, and secure improvements to the river's health by providing flexibility in how the system is managed in the future.

At the July 2008 Council of Australian Governments' meeting, a funding commitment of $610 million was secured by South Australia from the Commonwealth Government.

Within this commitment, funds will be allocated to the following catchment projects:

- $120m for Lower Lakes Pipelines to secure a quality water supply to the townships, communities and irrigators who draw water from the Lower Lakes
- $200m for Lower Lakes and Coorong Recovery to undertake a series of medium to long-term projects around the Lakes and Coorong, to help protect this valuable Ramsar site and to sustain the communities that rely on it
- $110m for River Industry Renewal to reinvigorate irrigation communities including the uptake of innovative and smarter irrigation technology
- $100m for Riverine Recovery to improve our management of river wetlands and floodplains from the SA border to Wellington
- $80m for Water Buy Back to purchase water entitlements from willing sellers, with water to be held by the Commonwealth Environmental Water Holder.

Action

Complete, on time, the elements of the *Murray Futures* program designed to sustain, support and reinvigorate communities and industries within the Murray-Darling Basin in South Australia

Acid sulfate soils

Acid sulfate soils naturally occur in coastal and freshwater areas where there are large amounts of sulfate and organic material in the water. They are a natural part of the ecosystem. As long as the soils are covered by water they are harmless to the environment, but if water levels drop and the soils are exposed to the air they react with oxygen to form sulfuric acid (the same acid as in a car battery) and can release heavy metals and other toxins from the soil. Once exposed to air, a chemical reaction occurs, and sulfuric acid is produced. This acid, and the metals that are released, may contaminate the sediments they are released from, affect water quality, and damage the ecology of the local area.

The water levels in Lake Alexandrina and Lake Albert have dropped well below sea level and sulfidic sediments that have been safely covered underwater have been exposed and turned sulfuric. The movement of poor quality water upstream could put drinking water supplies to Adelaide, lower river townships and the upper South East at risk.

The Government is working on a comprehensive program for managing acid sulfate soils exposed along the River Murray and around the Lower Lakes due to critically low water levels.

The absolute first preference is for the Lower Lakes to remain a freshwater system. However, after three years of record-breaking low inflows in the Murray-Darling Basin, there is simply not enough water in the system to meet all current competing needs.

In extreme cases, acidification can cause ecological collapse, resulting in the death of everything living in the water and rendering the water unsuitable for any purpose. The current situation is serious and the State Government is not willing to risk such an outcome. Therefore, planning is currently under way to address such a worst-case scenario.

One option is to let a small volume of seawater into the Lower Lakes to protect them from acidification, but not flood them. However, this would be an absolute last resort measure, employed only if we reached the situation where freshwater flows were insufficient to avert acidification. This is not the preferred option and the State Government will delay any such decision for as long as possible to allow maximum potential for bioremediation or recovery.

The Governments preference is for a freshwater solution for the Lower Lakes. This is what the State Government is working toward through the development of Murray-Darling Basin Authority's basin-wide plan.

As a last resort, the Government, through SA Water, is preparing for the construction of a temporary weir near Pomanda Island. The purpose of the proposed weir would be to secure the public water supply for the areas of South Australia that rely on water extracted below Lock 1. The function of the proposed weir would be to restore and maintain the water level in the new pool upstream of the weir, and to provide a physical barrier that would prevent poor quality water moving from Lake Alexandrina into our drinking supply.

Action
As a last resort, build a temporary weir at Pomanda Island to protect the water supply to the 1.2 million people currently receiving it from the River Murray below Lock 1. The temporary weir would only be constructed if inflows remain at critically low levels and agreed triggers for acidification or salinity were activated and could not otherwise be prevented

Action
Undertake real-time management of environmental issues and potential risks affecting the Lower Lakes.

Salinity
Murray-Darling Basin salinity has the potential to be one of the most serious environmental and economic issues affecting South Australia. This is because of: our location on the lower reaches of the river; the natural geological structure of the Murray-Darling Basin (MDB) in which the river acts as a drain for salt out of the landscape; the influence of human development in mobilising salt to the river; and the ultimate impact of salinity on water quality for all uses, including supplying Greater Adelaide. Salinity impacts largely occur in South Australia through reduced water quality and degradation of the floodplain. River Murray salinity management is vital for maintaining the quality of our water for both urban and irrigation supplies.

The Basin Salinity Management Strategy 2001-2015 (BSMS) provides the strategic policy framework for managing salinity across the basin. Achievement of its management objectives is measured through a set of Salinity Registers, the degree of achievement of end-of-valley targets, and the Basin Salinity Target at Morgan in South Australia: 'to maintain the average daily salinity at Morgan at a simulated level of less than 800 EC, outlined in the World Health Organisation guidelines, for at least 95 per cent of the time, during the benchmark period'.

South Australia is accountable for actions that will change salinity in the River Murray. The actions are recorded as debits or credits on the Murray-Darling Basin Salinity Register, and include estimates of credit and debit positions for 100 years. *South Australia's Strategic Plan* also contains a salinity target: 'to maintain

a positive balance on the Murray-Darling Basin Salinity Register'.

The main approaches used to achieve South Australia's salinity management objectives include salinity zoning policies, improved irrigation efficiency, rehabilitation of drainage and delivery schemes, and salt interception schemes (SIS).

The South Australian Government invests in these schemes, in partnership with the Victorian, New South Wales and Commonwealth Governments. The Riverland's four operating schemes prevented about 150,000 tonnes of salt from entering the River Murray during 2008. This equates to 400 tonnes of salt per day. In the same period, the Loxton scheme began partial operation (due for completion in 2009); work continued on the extension of the Waikerie scheme (due for completion mid 2009); construction of the Murtho scheme commenced ; and planning began on a further scheme near Renmark.

Significant progress has been made in addressing salinity in the River Murray. The overall result is that productive agricultural areas have been able to expand. Indeed, on the Salinity Register South Australia currently has a strong positive balance.

However, a number of key salinity management issues need to be addressed to ensure overall River Murray system health. In particular, under 'normal' climatic conditions, approximately one million tonnes of salt is discharged annually to the sea. Low flows and the lack of small-to-medium flood events in the past decade have meant that much of this salt is now stored in the floodplain. It is suggested that a return to more 'normal' flows and flooding events, and the reconnection of wetlands, could mobilise this salt into the river. This could pose a significant production and water quality issue for South Australia.

The South Australian Government is committed to meeting salinity targets through the implementation of salt interception schemes, and is investigating opportunities to productively use the additional saline water that will be generated. Opportunities include re-use, salt harvesting, energy production and aquaculture.

A pilot project near Waikerie is generating information and interest in an inland saline aquaculture industry.

Action

Maintain a positive balance on the Murray-Darling Basin Salinity Register, and continue to implement strategies and actions to ensure the real-time management of salinity in the lower reaches of the River Murray so that water quality remains at levels suitable for human consumption

Explore the economic and environmental feasibility of using saline water produced in Salinity Management Schemes.

Climate change

The potential impacts of climate change on Greater Adelaide have been outlined earlier in this Plan (Part 3 – The challenges of demand and supply). Not only are the impacts inconsistent across the State, but understanding of the implications also varies. To adequately manage and protect our water resources, we need to know more. As part of the development of regional water demand and supply plans, we will undertake regional-scale assessments of the impacts of climate change where this has not already occurred.

Action

Commission, where required, regional-scale studies on the impacts of climate change on water resources.

Bushfires

Bushfires have a dramatic effect on the physical, chemical and biological processes in water catchments, and they can also have a long-term impact through reducing catchment yield when damaged flora is regrowing.

The likelihood and impact of fires occurring within reservoir catchments significantly increases in a drying landscape because:

- fuels and soils are drier, adding to the likelihood of more frequent and intense fires
- in times of drought vegetation in catchment areas is sparse. Vegetation is one of the natural barriers that help prevent impurities from entering water supply reservoirs
- it takes longer for burnt vegetation to re-sprout and for seeds to germinate, and this prolongs the time catchment soil and sediment is left mobilised and available to be washed into waterways and reservoirs. This reduces water quality
- less water is stored in reservoirs and watercourses, making water contamination more likely.

Heavy rainfall in the catchment areas following a bushfire is also a concern because little vegetation is available to naturally filter the higher than normal levels of sediment, organic material, ash and micro-organisms.

Given the drying conditions in the Mount Lofty Ranges Watershed, and the extended high fire danger season, SA Water has developed a post-fire recovery strategy for water quality. In line with this strategy, SA Water will manage its drinking water catchment areas by:

- assessing the risk of fires occurring
- developing procedures for minimising the risk of raw water contamination and reducing the level of treatment required.

Action

Implement SA Water's Fire Recovery Strategy for all reservoirs in the Mount Lofty Ranges catchments.

Water allocation

A major threat to the future protection of South Australia's rivers, creeks and groundwater is extraction that exceeds the capacity of those resources – both within the State and prior to the water arriving here (e.g. the River Murray, Great Artesian Basin and South East aquifers).

South Australia has a comprehensive, adaptive approach to managing the volume of surface water, watercourse water and groundwater through prescription. Areas that are prescribed are managed through Water Allocation Plans (WAPs). Under the *Natural Resources Management Act 2004*, Natural Resources Management Boards are required to develop WAPs.

A WAP is a legal document summarising the rules for allocation, use and transfer of water from prescribed water resources. Under the *Natural Resources Management Act 2004*, both the needs of the natural environment, and human demands, are to be considered in determining appropriate limits on the amount of water which can be diverted from a water resource for all uses.

A prescribed water resource may consist of surface water areas, groundwater areas, or watercourses, or a combination of these. Across South Australia there are currently 27 prescribed water resources.

This approach has been successful in protecting many water resources across the State, however, its challenges include:

- the development, review and amendment of a WAP takes a long time, reducing the resource managers' ability to quickly respond to change
- ensuring appropriate and timely management action is taken to protect resources that are not yet prescribed.

Quicker and more adaptive water allocation planning process

One of the challenges to managing prescribed water resources is the length of time it takes to develop, review and amend Water Allocation Plans (WAPs). There are valid reasons for this, including:

- gaining a sound scientific understanding of the water resource
- dealing with complex legislative and policy frameworks
- undertaking extensive community engagement and consultation
- developing locally appropriate solutions and policies.

However, this time lag can reduce our ability to quickly respond to change. Also, to protect resources while WAPs are developed, water use and trading is often restricted during this period. While necessary to protect the resource from over allocation, this situation can create uncertainty for water users.

A two-staged approach to water allocation planning could address these issues.

Gaining a sound scientific understanding of a water resource is important but it is very time-consuming and significant resources are required to undertake appropriate studies. A possible solution is to use an appropriate model to determine allocations and issue interim water allocation licences, with a timeframe attached. This would allow the allocation to be changed, if necessary, after the scientific work had been completed. Meters would be required for every licence as annual water use returns would need to be lodged to provide a better understanding of the potential impacts.

The Interim WAP would be based on limited scientific knowledge of the resource but would allow licences to be issued with conservative allocations. These allocations could then be reduced or increased when the comprehensive WAP had been developed and scientific knowledge of the resource expanded. Further information on the resource would be gained by using meters and annual water-use returns.

It would be necessary to calculate conservative estimate allocations for the purposes of an Interim WAP. This would reduce the risk of allocations being lowered once the necessary research had been completed. Allocations would only be granted to existing users. New allocations would not be made until sufficient scientific knowledge had been obtained.

The Interim WAP would operate for a limited time and work would be undertaken during this period so that the Comprehensive WAP would be produced in a timely manner. The Interim WAP would allow for limited trade during its lifetime, particularly with sale of property.

The Interim WAP, despite taking a precautionary approach, may not be sustainable nor would it address sustainability issues in the region. While it was in place it would be important to monitor the water resources and water-dependent ecosystems in the area to determine what impacts were occurring.

There would be some community consultation undertaken to inform the development of the Interim WAP but it would be a simpler process than that envisaged for the development of the Comprehensive WAP.

Action

Complete water allocation plans and regulatory review of water allocation plans for key areas in the MLR, the Murray-Darling Basin, the South East and Central Adelaide

Action

Adopt a two-staged approach to water allocation planning, with an Interim Water Allocation Plan followed by a Comprehensive Water Allocation Plan for all newly prescribed areas.

Unbundling water rights

South Australia, along with other States, is in the process of making changes to water licensing arrangements as part of its commitment to the *National Water Initiative*. In summary, the existing water licences will be separated into their main components. These include a Water Access Entitlement, a Water Allocation, a Site Use Approval, a Water Resource Works Approval and a Delivery Capacity Entitlement.

These changes aim to benefit water users by making transfers easier and more efficient, expanding the choices available for water management, and clarifying water rights. The intention is to create greater certainty for investors, and increase the efficiency of water markets and water use.

Existing licence holders will continue to own a secure, personal property right in water (the new Water Access Entitlement). However, the changes will improve the opportunities for those who wish to participate in the water trading market, making it explicitly clear to buyers and sellers what exactly is being bought and sold.

The South Australian Government has developed a Water Trading in SA website: http://e-nrims.dwlbc.sa.gov.au/wtr. It lists every approved water trade in the current water year (July 1 to June 30) for each of the prescribed areas in South Australia. The information is updated on a daily basis. The annual summaries from 2004-05 to the most recent year provide both intra and interstate trades.

Action

Continue programs to unbundle water rights across South Australia and remove barriers to trading water entitlements.

Managing non-prescribed water resources

Currently, the *Natural Resources Management Act 2004* provides the following mechanisms for managing non-prescribed water resources:

- the powers of the Minister
- statutory requirements for permits for wells
- it is the duty of the owner of land on which a watercourse or lake is situated or that adjoins a watercourse or lake, to maintain and protect it
- limiting the right to access water to the extent that this does not infringe on another's right, unless water is taken for stock and domestic purposes
- permit requirements, policies and programs that may be applied through Natural Resources Management Plans.

Management of water extracted for use from non-prescribed water resources is managed through permit requirements, and the limits which apply to statutory rights to access water under the Act.

The Minister can make a recommendation for a regulation declaring a prescribed water resource if satisfied that the proposed regulation is necessary, or desirable, for the proper management of the resource to which it will apply. In the past, for various reasons, some water resources have not been prescribed until stresses on them have become evident.

The State's non-prescribed water resources require monitoring and management to avoid over allocation.

As we move into an environment where water resources are increasingly scarce, a fuller understanding of our total water resource capacity, and a more pro-active approach to management, is required. This should also provide increased confidence to investors.

To address this issue, we will explore and develop ways for better managing all of the State's water resources to prevent them from being over exploited. This will be supported through the expansion of the monitoring network and an increase in the regularity of assessment and reporting, so that the state and condition of all resources can be better understood.

Action

Bring additional water resources into formal management through prescription and water allocation planning, as necessary.

Baseline understanding of the state of our resources

State Government monitoring, assessment and reporting programs support the management of water resources. These programs are critical to the protection of our groundwater, surface water and watercourse water, as they allow appropriate management responses to be developed, based on the condition of the resource.

South Australia is a large state and the investment required to effectively monitor and assess all water resources is immense.

The state and condition of our water resources may change as a result of the impacts of a changing climate. The pressure to access new water resources also will increase. Baseline data, comprehensive monitoring and regular assessment are needed to ensure that any significant decline in these resources is detected as soon as possible. Changes to land use, for example through increased mining, increase the potential for impacts on the water resource to go undetected unless adequate monitoring and assessment is in place.

Baseline information is important to avoid major over allocation, similar to that which has occurred in the Murray-Darling Basin. Without this information, the State's capacity to support landholders in implementing sustainable water management and, where necessary, regulating use to protect the resource, is significantly impaired.

Changes to the state and condition of the State's water resources are occurring at such a rate that, where required, expansion or upgrade of the State's monitoring network, and increased regularity of assessment, is essential to enable our water resource managers to make proactive rather than reactive decisions.

Also, an integrated and coordinated monitoring and assessment framework for water resource data obtained by different State Government agencies is essential to obtain a complete picture of the use and health of all water resources within a region.

To ensure State Government agencies have appropriate and timely information to make coordinated, proactive water management decisions there will be increased and ongoing investment to enhance this important work. Further effort will also be made to improve the co-ordination and management of the significant investment in the State's water monitoring and assessment infrastructure.

As part of the Commonwealth Government's *Water for the Future* program, $450 million was allocated to the *Improving Water Information Program*, which is being administered by the Bureau of Meteorology (BOM). Box 3 provides more detail about the program.

To improve the management and coordination of water information, the State Government will work with the Bureau of Meteorology to create a *Strategic Water Information and Monitoring Plan* for South Australia.

Action
Provide funding of $8.6 million over two years (2009-10 and 2010-11) to strategically review and, where required, expand or upgrade the water resources monitoring network

Action
Increase regularity of statewide data collation, assessment and reporting, where required

Action
Work with Bureau of Meteorology to develop a Strategic Water Information Plan.

Box 3: Improving Water Information Program
This program, which is administered by the Bureau of Meteorology (BOM), will enhance the quality and utility of Australia's water information.

The Bureau will deliver a range of products designed to meet the needs of users engaged in water policy development, planning, operations, public enquiry, education, and research, including:

- regular national water resources assessments
- an annual National Water Account
- real-time water reporting services
- real-time water availability forecasts.

To deliver water information to users, the Bureau will develop and maintain the Australian Water Resource Information System (AWRIS) – an online information tool freely accessible to the public.

AWRIS will integrate and add value to extensive measurements of river flows, groundwater levels, reservoir storage volumes, water quality, water use, water entitlements and water trades. It will be the authoritative repository for water data and reporting in Australia.

AWRIS is being developed for a range of uses and users. It will deliver data, dashboards, information, tools and reports that will significantly improve the decision-making capabilities of its users engaged in policy development, planning, operations, public enquiry, education and research.

The Bureau will build, own and manage AWRIS, which will evolve and expand over the next 10 years to deliver more content, faster access, and more sophisticated functionality.

Establishing agreed environmental water quality targets

Water resources are used and valued for a range of reasons, by a range of users.

A different quality of water is required for different purposes, for example, horticulture and agriculture, mining, drinking water and recreation. To effectively manage our water resources and catchments we must understand what the community needs from its water supply, and we need a process to ensure that we can fulfil those requirements.

The *National Water Quality Management Strategy* (NWQMS) provides a basis for the sustainable management of water resources in South Australia. It contains nationally agreed policies, processes and guidelines that form part of the Council of Australian Governments' Water Reform Agenda. Its primary objective is 'to achieve sustainable use of the nation's water resources by protecting and enhancing their quality while maintaining economic and social development'.

A key component of the NWQMS is the establishment of Environmental Values (EVs) and Water Quality Objectives (WQOs) for particular water bodies (surface and groundwaters). EVs describe the uses for which a local community agrees a body of water should be protected (e.g. aquatic ecosystems, stock watering, drinking-water supply, recreation). WQOs are the corresponding water quality targets that must be achieved or maintained to protect the EV. The setting of WQOs also takes into account the social and economic impacts of achieving a particular target. Table 6 outlines the common environmental values of water bodies.

The setting of EVs for surface and groundwater enables catchment management, monitoring, and improvement programs to be targeted and efficient. They provide a focus for agencies and stakeholders working within the region and ensure that works are targeted to address pollution problems. They also can provide clarity and consistency for future development.

Table 6
Various Environmental Values

Environmental values	Description
Aquatic ecosystems	Supporting pristine or modified **Aquatic ecosystems**. Different levels of protection are considered, depending on how modified or disturbed the current ecosystem
Primary industries	**Irrigating** crops such as vines, lucerne, etc
	Water for **farm use** such as in fruit packing or milking sheds, etc
	Stock watering
	Water for **aquaculture** such as barramundi or marron
	Human consumption of wild or stocked fish or crustaceans
Recreation & aesthetics	**Primary recreation –** direct contact with water, such as swimming or snorkelling
	Secondary recreation – indirect contact with water, such as boating, canoeing or sailing
	Visual appreciation – no contact with water, such as picnicking, bushwalking, sightseeing
Drinking water	**Raw drinking water** supplies for human consumption
Industrial uses	Water for **industrial use** such as power generation, manufacturing plants
Cultural & spiritual	**Cultural and spiritual** values, including the cultural values of traditional owners

EVs have been developed for some water bodies across South Australia. Currently the Government is working with the community to develop EVs and WQOs for the Adelaide and Mount Lofty Ranges Natural Resources Management Board region. In the future, EVs and WQOs will be required for all priority surface and groundwaters across the State.

The benefits of this approach include:

- clarification and agreement on the range of realistic values and uses that the community places on water resources to incorporate upfront in planning and decision-making
- clear targets enable efficient and effective management programs that will reduce pollution
- identification of priority areas and time targets for water quality improvement
- protection and conservation of high ecological-value waterbodies
- maintenance and enhancement of the health of waterbodies
- community involvement in water resource protection and management
- the ability of monitoring programs to report on objectives/targets.

In addition, in areas of critical importance such as the Mount Lofty Ranges catchments, the River Murray and Lower Lakes, Water Quality Improvement Plans will also be developed. These plans will outline the measures necessary to ensure that water quality meets desired values, as is the case for these catchments.

Action
The Environment Protection Authority will develop environmental values for priority water bodies across the State by 2014

Action
Develop water quality improvement plans for the Mount Lofty Ranges Watershed by 2011, and for other critical water catchments across the State by 2017.

Mount Lofty Ranges Watershed Priority Areas Policy

All policies relating to the protection of the Mount Lofty Ranges (MLR) Watershed recognise existing uses and their importance. We need to protect these existing uses in a way that ensures they will not lead to the further deterioration of the water resources.

The development of the Western Mount Lofty Ranges Water Allocation Plan will provide the means to protect the water resources across the watershed and beyond from over-extraction, while protecting existing uses.

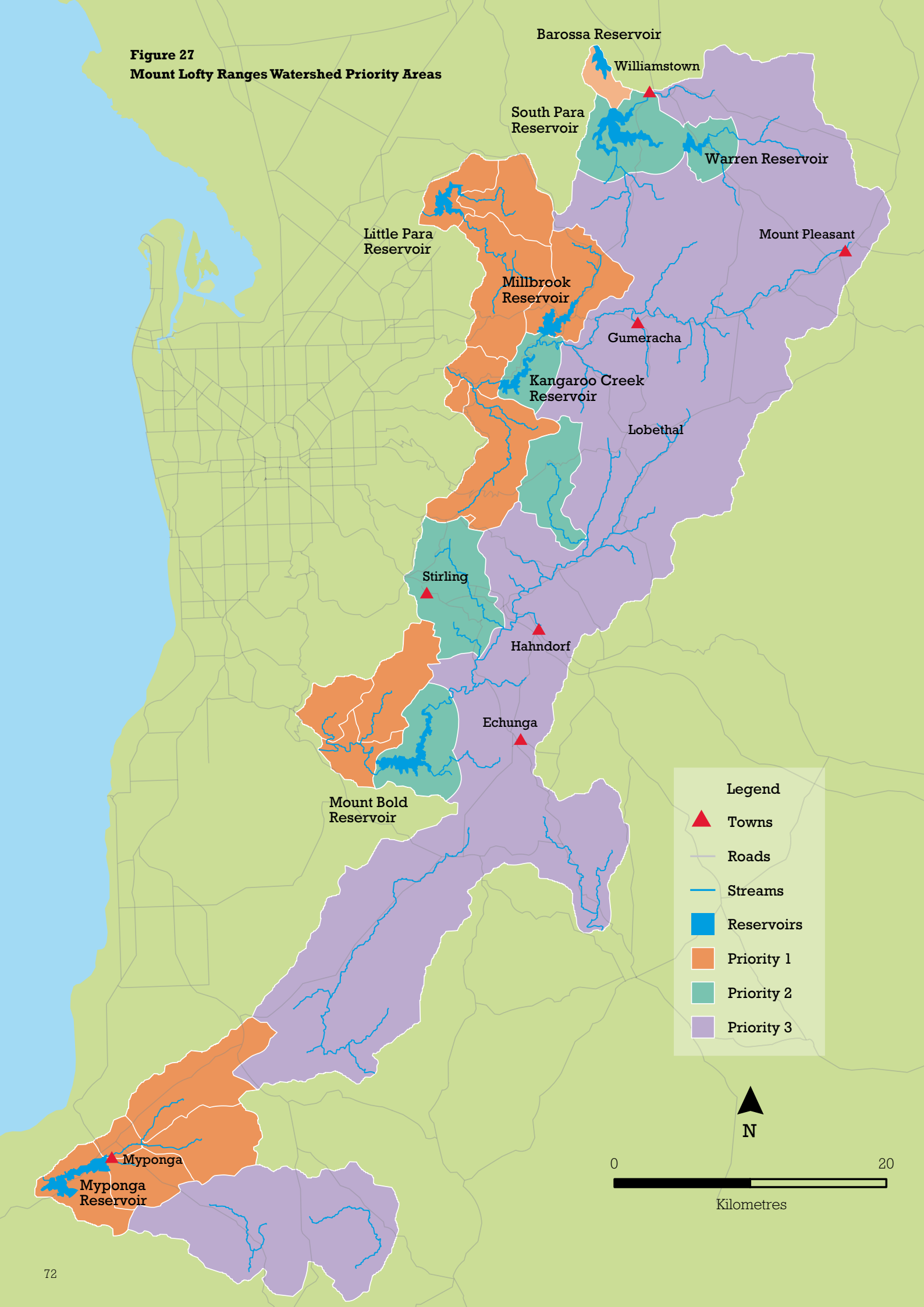
It has been recognised for some time that we also need appropriate planning policies and development controls to minimise the cumulative impacts on water quality of small scale developments, such as homes.

The *2006 Planning Strategy for the Outer Metropolitan Adelaide Region* recommended policies and management measures for development in the Mount Lofty Ranges Watershed to ensure that future development has a beneficial or neutral impact on water quality. The watershed was divided into three areas to differentiate the inherent risks of new development. These three catchment areas were identified based on the water pollution risk they pose to the reservoirs, and are shown in Figure 27 on the following page. They were developed following extensive research and consultation, including benchmarking against other Australian capital city water supply catchments.

The policy recommendations in the Planning Strategy still require implementation and the urgency for this work continues to grow as the pressure for development intensifies, along with the impacts of climate change. Those recommendations have been reflected in **Water for Good**, as they continue to be relevant.

Action
Establish planning policies, based on the water quality risk hierarchy associated with the Mount Lofty Ranges Watershed Priority Areas, to ensure that new developments have a beneficial, or at least neutral, impact on water quality in the Watershed.

Figure 27
Mount Lofty Ranges Watershed Priority Areas



Protecting drinking water catchments

In the future, protecting our drinking water catchment, in particular the water in the Mount Lofty Ranges (MLR) Watershed will continue to be important, and possibly more important, as the impacts of climate change are felt. The proposed water industry and planning legislation, outlined in Part 6, will help to address this by recognising the significance of Adelaide's unique watershed environment and other catchment areas.

Under these new arrangements, agreed statewide visions, targets and responsibilities will be determined for the MLR Watershed. Each agency will need to report annually on how it is meeting its targets and commitments.

More work is required to ensure that agencies are working together in the most effective and coordinated way to guarantee that drinking water catchments are being adequately protected and the costs and risks of treating water are minimised.

Action
Undertake a comprehensive review of current management and protection of the MLR Watershed with a view to developing an agreed vision, targets and responsibilities for its future management by the end of 2010

Action
Require relevant agencies to report annually on how they are meeting the MLR Watershed targets.

Forestry

A united, coordinated approach to forestry development across the State is critical to South Australia's catchment protection. Future commercial forestry expansion – and the quantity of water available for allocation for such growth- must be aligned.

It is widely accepted that changing land use to large-scale plantation forestry has hydrological and hydrogeological implications. This is because the water used for forestry is greater than for the dryland farming purposes it usually replaces.

As a signatory to the *National Water Initiative* (NWI), the South Australian Government has agreed, among other things, to implementing a series of measures to account for, and manage the water interception effects of, land use change such as large-scale plantation forestry.

At the same time, increasing sustainable forestry resources is a priority. *Plantations for Australia: The 2020 Vision* is a strategic partnership between the Commonwealth, State and Territory Governments and the plantation timber growing and processing industries.

The overarching principle of the this strategy is to enhance regional wealth creation and international competitiveness through a sustainable increase in Australia's plantations, based on a notional target of trebling the area of commercial tree crops to around three million hectares by 2020. Plantation forestry may also expand into lower rainfall areas for the purposes of carbon sequestration.

The ability to expand the area of commercial forestry in South Australia may be limited by the availability of a sustainable water supply to support such growth. To address this issue, the State Government has developed a statewide policy framework for managing the water resource impacts of plantation forests. The framework recommends that water licences and permits under the *Natural Resources Management (NRM) Act* be the principal management options for agencies, including regional NRM Boards, to manage the water resource impacts of plantation forests.

The *NRM* provides for control of activities that affect water resources by applying licence or permit systems to those activities. To manage the water resource impacts of plantation forestry under the current permit system, a regulation is needed to prescribe forestry as a water affecting activity.

The licensing system manages water resources by allocating specified volumes to licensed users of a prescribed water resource. Under the *Natural Resources Management Act*, commercial forestry is not defined as a water-taking activity and therefore cannot be subject to water licensing requirements at this time.

Amendments to the *Natural Resources Management Act* are therefore required to enable commercial plantation forests to be licensed for their water resource impacts, where the water resource is prescribed, and where forests have a significant impact on water resources.

Amendments to the *Natural Resources Management Act* will be introduced during 2009.

Action

Implement a statewide policy framework for managing the water resource impacts of plantation forests, and amend the *Natural Resources Management Act 2004* to allow forest water licensing, where appropriate, consistent with the statewide policy framework.

Mining

The State Government predicts that mining will be the dominant industry in South Australia for decades to come. Already South Australia's share of national mining activity is approximately 13 per cent and we have a healthy list of mining projects coming up for approval.

Mining in all its forms is water-intensive and it is important that we ensure that water sources are protected as the industry grows. New mining ventures will be expected to provide their own water supplies and reuse or reinject water sourced through dewatering activities.

For example, in its Environmental Impact Statement (EIS) released in May, BHP Billiton proposes building a desalination plant to support the proposed expansion of the Olympic Dam copper-uranium mine in the Far North.

According to the EIS, the expanded mine would have significant water and energy demands. It would consume up to 250 ML of water a day. (currently 37 ML of water a day.) The development would include a new 10,000 person village and the existing township of Roxby Downs would expand.

The South Australian, Northern Territory and Commonwealth Governments all need to approve the expansion.

Action

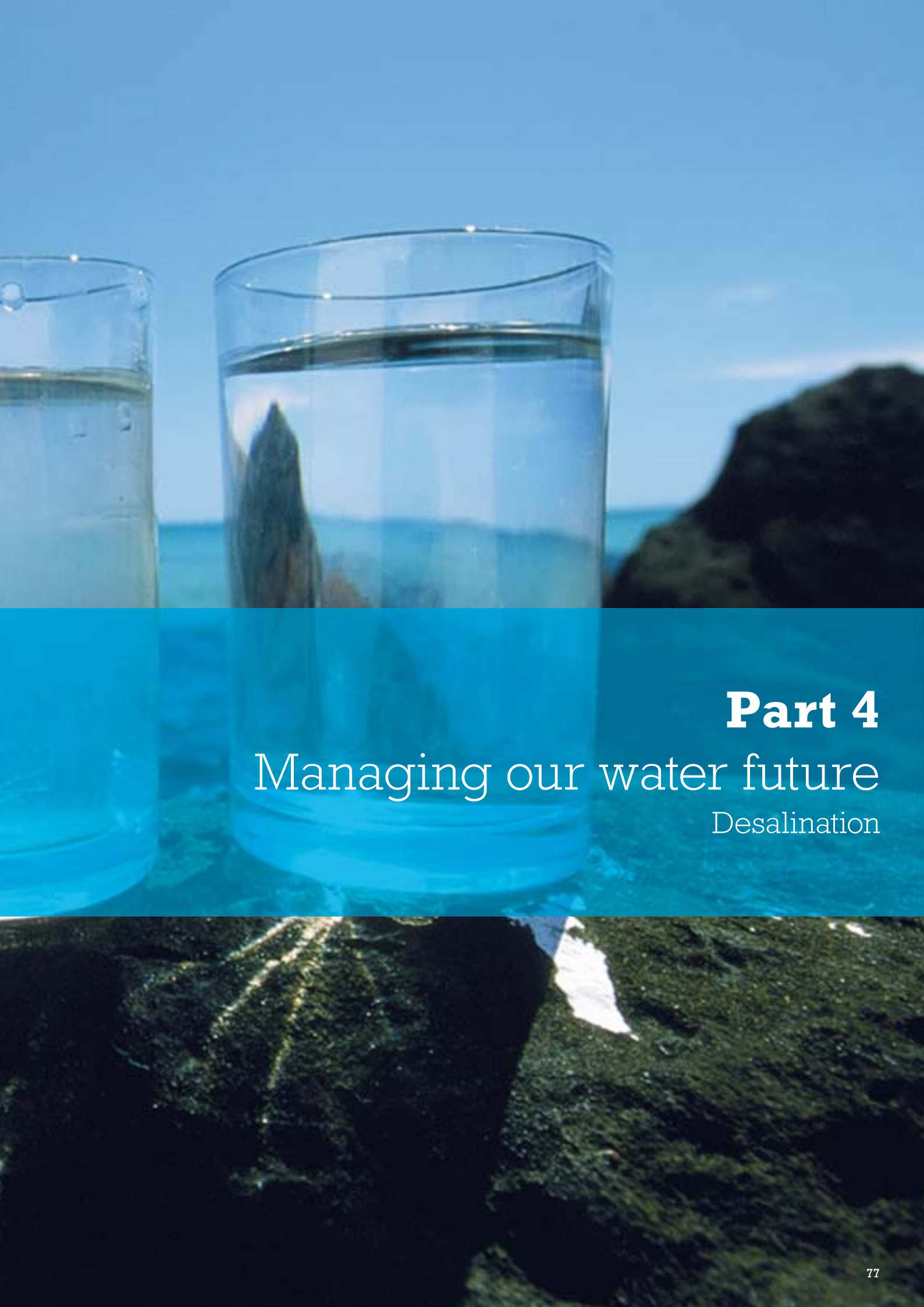
Require mining ventures to provide their own water supplies within the sustainable framework of natural resources management planning, and regional water demand and supply plans.

Part 4

Managing our water future

WATER FOR GOOD

South Australia's traditional water resources are more likely than those in other states to be impacted by climate change, and with our determination to reduce our reliance on the River Murray it's critical that we focus on non rain-dependent water sources.



Part 4

Managing our water future

Desalination

Desalination

Desalination is one of the key elements of the South Australian Government's strategy to address water security.

Key points

- desalination provides a secure, non rain-dependent source of drinking (potable) water
- South Australia's traditional water resources are more likely than those in other states to be impacted by climate change. As a consequence, we are more likely to have to rely on non-rain-dependent water sources in the future
- more than 50 small desalination plants already operate around the State
- issues that require careful consideration and comprehensive management include capital and operating costs, power use, source water pre-treatment requirements, brine disposal, cleaning of membranes and mixing of 'product water' with non-desalination water
- the Adelaide Desalination Plant will use state-of-the-art technology to minimise environmental impacts and enable it to operate over a range of flow rates
- desalination can be used to process treated wastewater and brackish groundwater for use in industry or mining processing
- adequate power supply and suitable land for future desalination plants are essential and need to be planned for.

Actions and outcomes

Outcome
Enhanced water security for Greater Adelaide and South Australia through desalination.

Actions under way
Construct a major desalination plant powered by renewable energy to supply Greater Adelaide with 'first water' by December 2010, 50 GL/a by mid 2011, and 100 GL/a by the end of 2012

Additional water sources including desalinated seawater will supplement the Eyre Peninsula water resources, subject to site and environmental investigations

Complete the investigation for the design of, and need for, interconnection works between Adelaide's southern and northern water supply systems. Investigate the viability of constructing groundwater desalination plants for regional townships where water quality (i.e. salinity) has been identified as an issue. This will enable improvements to these water supplies by 2025 at the latest.

Outcome
A clear, consistent and transparent approach to the approval processes for desalination proposals.

Actions under way
By 2010, finalise a statewide desalination policy to guide future desalination plant proposals, including the identification of additional suitable sites in case they are needed in the future.

What is desalination?

Desalination is the process of removing dissolved solids – primarily salts – from a water source such as seawater, groundwater, estuarine water or highly treated wastewater.

A number of different technologies or processes have been developed. The two most common and widely available commercially are thermal distillation (evaporative) and reverse osmosis (membrane-based). In reverse osmosis, the seawater is pressurised to force water molecules through a fine-pore membrane that blocks the salt ions, viruses, micro-organisms and other impurities which are retained by the membrane in a concentrated solution for subsequent disposal. Thermal methods remove salts by evaporating seawater and then condensing the vapour back to drinking water. Advances in membrane technology, improved energy efficiencies and recovery methods, and greater economies of scale have resulted in reverse osmosis being a more cost-effective solution for continuous supply plants.

Desalination in South Australia

More than 50 private and publicly owned desalination plants already operate around the State, mainly desalinating brackish groundwater. These plants provide low salinity, non-drinking water for the irrigation, industrial, power and health sectors (renal dialysis) and can typically produce 100 – 1000 kL/day. Plants at Penneshaw, Coober Pedy, Marion Bay and a number of remote Aboriginal communities provide drinking quality water.

Desalination has the potential to be a significant component of South Australia's future water supply. It will be especially important in areas of high growth (e.g. Greater Adelaide), for mining developments (e.g. Far North), and where groundwater supplies are declining (e.g. Eyre Peninsula).

Many desalination projects have been proposed. They include the following:

- BHP Billiton is investigating the feasibility of a major plant at Port Bonython in the Upper Spencer Gulf to supply an additional 200 ML/day for the Olympic Dam mining development. The State Government considered participating in this project to service the water demands of the Upper Spencer Gulf. However, given the actions in this Plan, including doubling capacity of the Adelaide desalination plant, the State Government has decided that it will not be necessary to continue with an involvement in the development of the Upper Spencer Gulf Desalination Plant
- the Government will, however, work with local government in the region to ensure the water needs of the Upper Spencer region are met
- Salisbury Council has announced plans to desalinate saline groundwater using a wind-power generated plant as part of a local aquifer refreshment program
- a proposal to desalinate a large quantity of saline groundwater from the Noora Wells area near Paringa, for return to the River Murray, has been investigated but not considered viable due to limitations on disposal of brine

- SA Water has identified a number of regional centres where water shortages or water quality (e.g. salinity) associated with groundwater supplies is an issue that could be addressed through desalination. Of these projects, Eyre Peninsula is the most urgent. Investigations are under way into five potential sites.

Action
Additional water sources including desalinated seawater will supplement the Eyre Peninsula water resources, subject to site and environmental investigations

Action
Investigate the viability of constructing groundwater desalination plants for regional townships where water quality (i.e. salinity) has been identified as an issue. This will enable improvements to these water supplies by 2025 at the latest.

Adelaide Desalination Plant

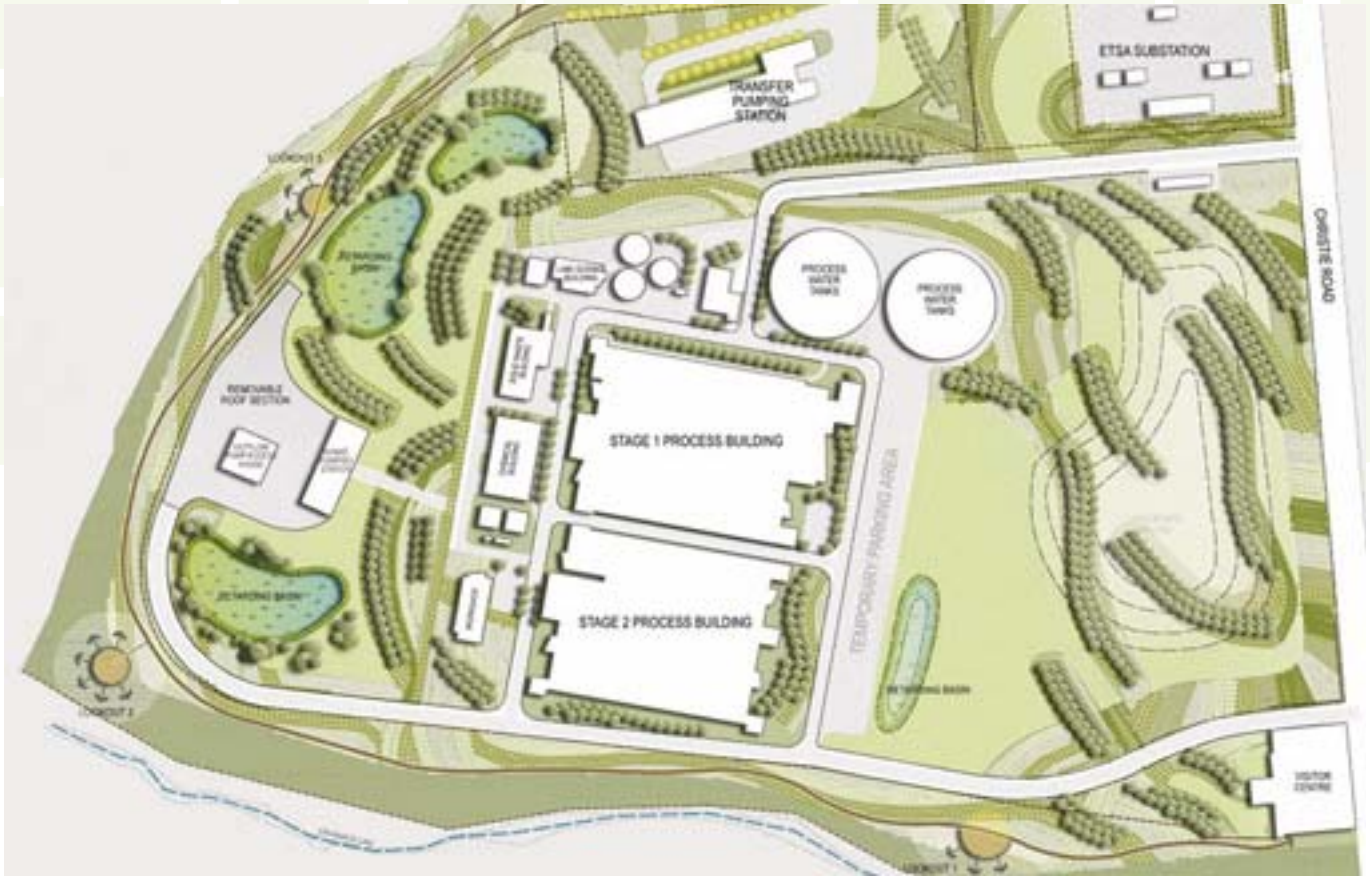
Project background

In December 2007, the State Government announced the construction of a 50 GL/a seawater desalination plant to address the immediate shortfall by supplying about a quarter of Adelaide's annual water needs. At that time, the Government specified that the plant must have the capacity to expand to produce 100 GL/a if needed. The Government has now announced the expansion of the plant to produce 100 GL/a.

Project delivery

This plant is being constructed at Port Stanvac and is scheduled to produce first water by the end of December 2010, 50 GL/a by mid 2011 and 100 GL/a by the end of 2012. The proposed site layout is shown in Figure 28.

Figure 28
Adelaide Desalination Plant



The project has three major components:

- the desalination plant and associated marine works
- a 12-kilometre pipeline to transfer desalinated water from Port Stanvac to the Happy Valley Water Treatment Plant
- the provision of construction and operational power supply for both of the above.

Following a rigorous selection process, in February 2009 it was announced that multinational consortium Adelaide Aqua would design, build, operate and maintain the new plant.

The reverse osmosis treatment process was selected because it uses far less energy than available alternatives.

Environmental impact and mitigation

The new plant will incorporate energy recovery technology and the latest energy saving devices.

The seawater intake structure is being designed so that intake velocities are low enough to minimise entrainment of seawater species into the plant.

All chemicals will be carefully monitored to ensure discharges comply with agreed environmental objectives and performance criteria established by the Environment Protection Authority.

The coastal landscape assessment for the desalination plant took account of the *Adelaide Metropolitan Coast Park Concept Plan* and *Land Not Within a Council Area (Metropolitan) Development Plan*. To integrate the development with the surrounding landscape, screen planting is planned for the northern property boundary.

The Adelaide Desalination Project was subject to the major development process, which included stringent environmental guidelines set by the Development Assessment Commission, and was subject to rigorous environmental scrutiny via the Environmental Impact Statement process and an Independent Technical Review Panel.

Capacity of the Adelaide Desalination Plant

In May the State Government announced it would proceed with an expansion to 100 GL/a, which the Economic Development Board supported in its *2009 Economic Statement*.

In its May 2009 Budget the Commonwealth Government announced that it would commit a further $228 million ($328 million in total) towards the cost of the plant, if it were expanded to 100 GL/a.

Action

Construct a major desalination plant powered by renewable energy to supply Greater Adelaide with 'first water' by December 2010, 50 GL/a by mid 2011, and 100 GL/a by the end of 2012.

Adelaide's southern and northern water supply systems will need to be better connected so that the full 100 GL/a from the expanded plant can be used. An interconnection project is expected to involve the upgrading of a number of mains and pumping stations to connect the Hope Valley water treatment zone (north) and the Happy Valley water treatment zone (south) so that large quantities of water can be moved between the two distribution systems.

A key benefit of this interconnection will be the flexibility to distribute water either to the north or south, which could be particularly useful during times of exceptional circumstances. In light of the decision to proceed with the 100 GL/a capacity plant, investigation of the design of, and need for, inter-connection works has been brought forward.

Action

Complete the investigation for the design of, and need for, interconnection works between Adelaide's southern and northern water supply systems.

Regulation of desalination

Desalination policy

Desalination can help ensure a reliable water supply, however, issues that require careful consideration and environmental management include:

- greenhouse gas emissions associated with construction and operation
- the impacts of disposal of saline concentrate (brine)
- the impact on coastal environments during construction
- the impact on marine organisms.

The State Government is reviewing the *Environment Protection Act 1993* with regard to the regulation of desalination plants.

Minimising ecological footprints

Both direct and indirect environmental impacts arise from desalination:

- indirect – the use of considerable energy to produce water and the greenhouse gas implications of this
- direct – the disposal of concentrated brine from large plants.

The extent and nature of direct environmental impacts depend on a number of factors, including the state of the plant, the size of the project, the contents of the brine concentrate, and how it is diluted prior to release. Source waters for production processes can include wastewater, contaminated brackish ground or surface waters, or seawater.

The environmental impacts of all desalination proposals will need to be assessed on a case-by-case basis. In assessing these impacts, and as part of seeking regulatory approval, the following should be addressed:

- The type and characteristics of the receiving environment – for instance, for seawater desalination, sites with high dispersion and mixing characteristics (deep water and tidal flows) would be preferred to shallow or enclosed bays

- Proximity to sensitive areas, ecological communities or areas of conservation value (e.g. conservation reserves, marine protected areas, national parks etc). Any impacts on identified areas or communities of ecological or conservation value should be avoided
- Adequate understanding of the local environment – collection of adequate environmental baseline data is crucial to establishing and understanding existing conditions so that reliable impact assessments and evaluations can be made. To obtain necessary environmental approvals, it should be essential to demonstrate that environmental impacts can be appropriately managed
- The extent and nature of construction-related impacts, including associated infrastructure (access to source water, power, site access, linking to existing networks), and impacts on existing uses (e.g. surfing or swimming beaches)
- Energy saving and greenhouse gas emission reduction technology
- Social impacts of clearing land or changing the use of land to construct a desalination plant, as opposed to another use.

Power and land

Desalination is as much a power issue as it is a water issue. The Government has committed to the Adelaide Desalination Plant using renewable energy sources, and the energy emissions of any further major desalination plants should be carefully considered. This is especially important given how well South Australia is placed to use alternative energy sources, including wave, wind and solar power.

The Economic Development Board's March 2009 *Economic Statement* identified potential sites for the development of alternative energy sources. In a similar way, future sites for desalination plants could be identified to ensure that sufficient power and open land is available.

Action

By 2010, finalise a statewide desalination policy to guide future desalination plant proposals, including the identification of additional suitable sites in case they are needed in the future.

Adelaide Desalination Pilot Plant

South Australia is at the forefront of stormwater and wastewater recycling and leads the nation in rainwater tank ownership. Recycled water is currently used for irrigation, in industry, for some non-drinking residential purposes such as garden irrigation and toilet flushing, and groundwater replenishment. Increases in stormwater and wastewater recycling will further diversify our water sources and reduce our dependence on traditional water resources, such as the River Murray.

Part 4

Managing our water future

Stormwater and wastewater recycling

Stormwater recycling

South Australia leads the nation in stormwater recycling and rainwater tank ownership. Further increases in the recycling of stormwater, including roof run-off, for appropriate purposes will diversify our dependence on traditional water resources, and provide economic, social and environmental benefits.

Recycled water is currently used for irrigation, in industry, for groundwater replenishment, and for some non-drinking residential purposes, such as garden irrigation and toilet flushing. Recently introduced national guidelines provide uniformity for public health and environmental risk assessments for some uses of recycled stormwater, including the potential to add it to the drinking water supply.

There is currently no evidence that recycling water for drinking supplies is necessary in South Australia. Augmenting public drinking water supplies with treated recycled stormwater would not be considered without a detailed, scientific understanding of risks and strong community support.

Key points

- South Australia has the technologies, open space and suitable aquifers to store and recycle more stormwater, although insufficient market opportunities, high capital costs and the lack of a master plan currently limit its greater use
- Many stormwater harvesting schemes are operated by local governments in metropolitan and rural South Australia
- This Plan launches the Stormwater Management Authority's detailed investigation of urban stormwater harvesting opportunities in the Adelaide region. The study provides a factual basis for identifying a target of 60 GL/a harvesting capability. It estimates that a further $600-$700 million above committed funds would be required to achieve this. This estimate excludes the cost of land, distribution, customer connections, and other costs, including almost 18 GL/a for existing and committed schemes
- Existing stormwater harvesting schemes in Adelaide are capable of harvesting more than 6 GL/a, with currently committed schemes expected to provide almost 12 GL/a in additional harvesting capacity. Rainwater tanks provide about 1 GL/a
- Climate change could reduce Adelaide's urban catchments yields by about 15 per cent by 2050
- The most suitable aquifers for the storage of harvested stormwater are the limestone aquifers in the northern and western suburbs of Adelaide
- Roles and responsibilities for stormwater harvesting and management need further clarification
- The community strongly supports the greater use of stormwater
- Increased use of fit-for-purpose water supplies requires careful management to protect public health and the environment. While we will monitor future scientific developments and technological innovations, we do not intend to feed recycled stormwater directly into the mains water system
- As individuals and communities increasingly rely on alternative water supplies, it will be important to ensure that people understand how to use resources wisely to minimise health risks.

Actions and outcomes

Outcome

In 2013, Government and private sector partnerships are capable of harvesting 20 GL/a of stormwater in Greater Adelaide, for non-drinking purposes more than doubling our current harvesting capacity.

New actions

Subject to Commonwealth assistance and in partnership with local government, stormwater harvesting and recycling will be underway, including:

- in the western metropolitan area including Cheltenham Park, Riverside Golf Club, Old Port Road and Adelaide Airport
- in the southern metropolitan area, building on the first stage of Water Proofing the South
- in Playford and Salisbury, creating further capacity in the northern area, building on Waterproofing Northern Adelaide
- at the Adelaide Botanic Gardens, and
- at Barker Inlet

Work with local government to update the State-Local Government Stormwater Management Agreement. Clarify the roles of State agencies and local government; reinforce the importance of collaboration; and strengthen governance arrangements

Actions under way

Complete existing committed stormwater projects, including Cheltenham Park, to provide an additional harvesting capacity of almost 12 GL/a by 2013

Update, by 2010, State water recycling guidelines to reflect the *Australian Guidelines for Water Recycling*, and include stormwater.

Outcome

Target up to 35 GL/a of stormwater to be harvested in South Australia, for non-drinking purposes, by 2025. This will be achieved in partnership with other governments and the private sector, where verifiable geological data has identified suitable locations, and where cost-effective projects can be undertaken.

New action

Work with local government, the Stormwater Management Authority and other stakeholders (including the Commonwealth Government and private enterprise) to identify and develop new stormwater recycling projects in the Adelaide region, in line with the findings of the *Urban Stormwater Harvesting Options Study*.

Outcome

Target up to 60 GL/a of stormwater to be harvested in Adelaide, and up to 15 GL/a in regional South Australia, by 2050. This will be achieved in partnership with other governments and the private sector, where verifiable geological data has identified suitable locations, and where cost effective projects can be undertaken.

New actions

Develop a master plan for effectively managing stormwater in Adelaide. Include interim milestones

and water quality targets to support recommendations in the *Adelaide Coastal Waters Study Final Report* to provide up to 60 GL/a of recycled stormwater in Greater Adelaide by 2050

As part of regional water demand and supply planning, develop and implement plans to provide up to 15 GL/a of stormwater harvesting potential in South Australia's regional areas, by 2050.

Discussion

Demand for South Australia's limited, high-quality, natural fresh water for drinking can be reduced by recycling and using stormwater, including roof run-off to provide the following benefits:

- increasing the security of our water supply – by diversifying and supplementing supplies from other sources
- community prosperity and growth – water recycling supports business and tourism, particularly in areas where other water resources are limited, or expensive to develop
- environmental and economic benefits – by reducing the discharge of polluted effluent and stormwater into the environment, and increasing the value and potential uses of the receiving waters
- cost-sharing opportunities – through the involvement of a number of stakeholders
- planning opportunities – recognising potential to tailor investment in water infrastructure to the pace of new development and redevelopment
- public amenity – through the greening of open spaces, which aid health and well-being.

When considered in the simple terms of cost-versus-quantum of water supplied, recycling can be more costly than other traditional supply options. However, its value lies in the opportunity to simultaneously diversify water supplies and provide other benefits, such as reducing pollution flowing into our seas and rivers.

Stormwater harvesting

Urban areas in South Australia generate an estimated 120 GL/a of run-off, although this varies between years. The *Adelaide and Mount Lofty Ranges Integrated Natural Resources Management Plan* estimated that urbanised areas in the region produce about 86 GL/a of stormwater run-off (given average rainfall).

The *Urban Stormwater Harvesting Options Study* (undertaken by Wallbridge and Gilbert for the Stormwater Management Authority) is the most detailed investigation of urban stormwater harvesting opportunities at a metropolitan scale in any Australian capital city. It has involved a high-level assessment of the potential to maximise large-scale stormwater capture and storage in the Adelaide region. A focus has been to identify opportunities to use existing open space and groundwater systems to harvest and store large volumes of stormwater without significantly affecting existing land uses.

The study identifies a significant number of potential sites where large-scale stormwater capture and storage schemes could be developed. Combined they could harvest up to 60 GL/a by 2050. They include:

- large-scale schemes already operating – seven large and numerous small schemes, with a combined harvest potential of more than 6 GL/a
- harvesting schemes being developed – about 30 schemes with a total harvest potential of almost 12 GL/a.

The study estimates it would cost $600-$700 million to capture and store the additional 42 GL/a of stormwater for which funding has not been committed. (This Plan incorporates project and funding proposals for at least two of the 42 GL identified in the study). This excludes costs associated with allowances for purchasing land, as well as distribution and user connection. Partnerships with all tiers of Government and the private sector will be critical to delivering these projects.

Concepts proposed in the study report suggest infrastructure requirements would include more than 200 hectares of wetlands for harvesting and treating stormwater, and more than 600 bores for injecting stormwater into aquifers for temporary storage prior to use.

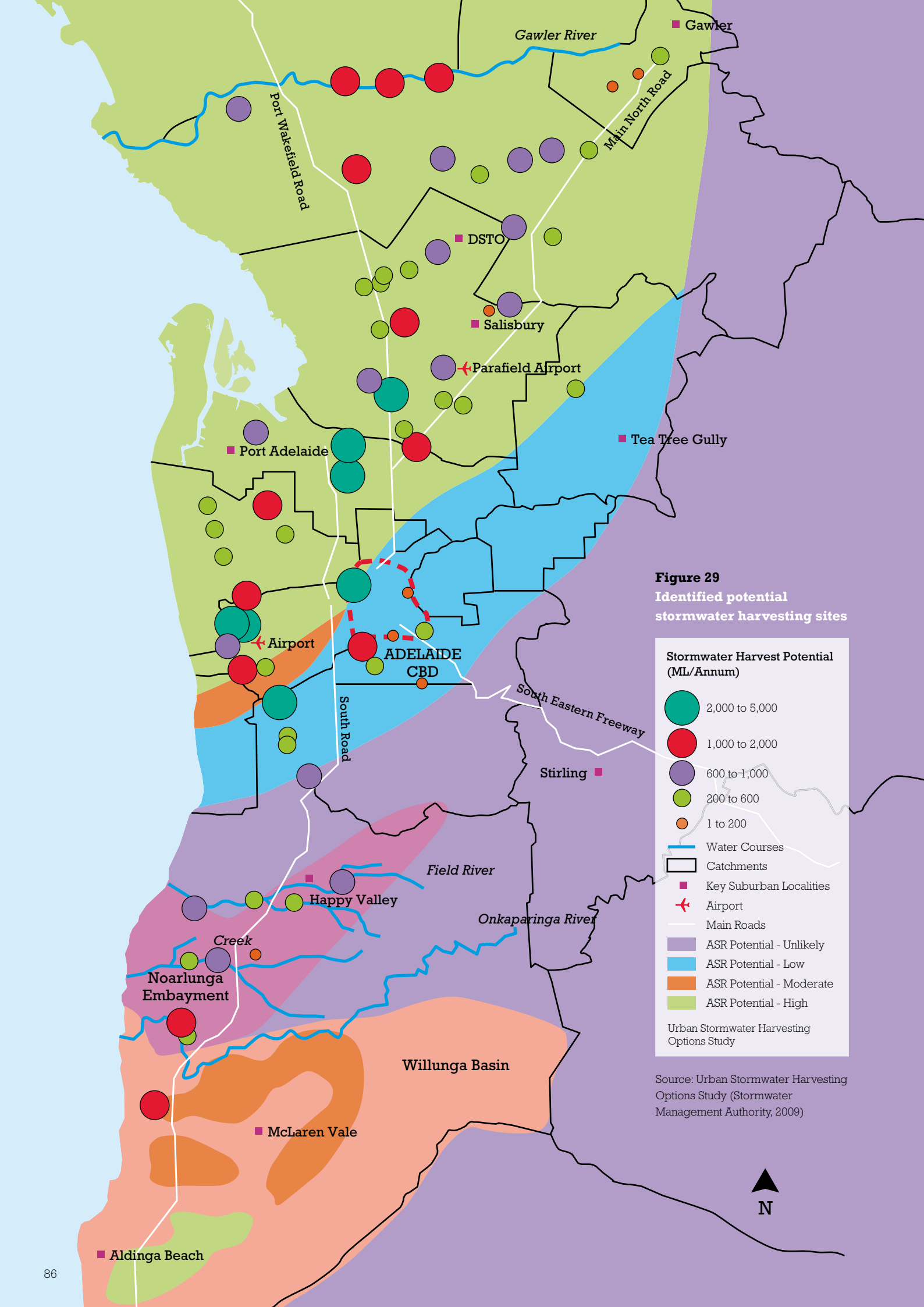


Figure 29
Identified potential stormwater harvesting sites

Source: Urban Stormwater Harvesting Options Study (Stormwater Management Authority, 2009)

The best sites for large-scale storage of stormwater are in the west and north of Adelaide, and south of the Onkaparinga River, where groundwater systems have good storage potential. Other areas of Adelaide have groundwater systems with 'unlikely', 'poor', 'low' or 'moderate' potential for large-scale stormwater storage potential. The study identifies potential to capture stormwater at some of these sites and then transfer it to other areas with better groundwater storage capacity.

The potential impact of climate change was considered, with modelling suggesting it could reduce catchment yields by about 15 per cent by 2050.

However, the study also suggests that this could be partly or fully offset by the amount of roof, road and paved surface run-off that would result from increased urban development.

The State Government will work with local government, the Stormwater Management Authority and other stakeholders to identify and develop new stormwater recycling projects in the Adelaide region, in line with the findings of the *Urban Stormwater Harvesting Options Study*. This will involve a systematic and more detailed assessment of identified opportunities. The Government will also work with other tiers of government to fully develop Adelaide's and South Australia's potential to be world leader in urban stormwater harvesting and reuse.

Figure 29 shows potential stormwater harvesting project sites identified in the *Urban Stormwater Harvesting Options Study*, including current and additional potential stormwater capture and storage sites.

Challenges for maximising stormwater recycling

Existing stormwater projects occur in favourable locations and, apart from *Waterproofing Northern Adelaide*, have tended to be individual schemes rather than part of an overall regional master plan.

Major stormwater harvesting is being considered for stage 2 of *Water Proofing the South* – a staged strategy developed by the City of Onkaparinga and its partners.

Maximising stormwater harvesting in other areas presents a number of challenges:

- urban run-off is rapid due to the hydraulic efficiency of paved surfaces and drains, and typically occurs in winter months when demand for treated stormwater (e.g. irrigation) is low. It can be challenging to capture large quantities of stormwater in surface storages
- open space to capture stormwater is limited in some locations. Where available, the upstream catchment may be relatively small, thus limiting the quantity of stormwater that can be captured
- potential customers of stormwater for non-drinking purposes may be insufficiently interested and motivated to alter existing water systems to connect to stormwater schemes. Reasons may include: issues of cost (including relative to use existing supply sources); payback for capital investments; perceptions about the quality or security of stormwater; or concerns about the potential for disruptions during the re-configuration of existing pipes
- diverse ownership of stormwater assets, watercourses and open space areas. Most urban run-off is generated on private properties and local council-owned roads and verges. This highlights the importance of establishing partnerships for managing stormwater
- stormwater quality can be highly variable, and catchment water quality data is generally limited or not available
- it would be costly and disruptive for many small users to retro-fit infrastructure (e.g. for existing homes)
- unless high-density development is planned to incorporate significant open spaces, irrigation and/or toilet flushing demands may be insufficient to justify the expense of bringing recycled stormwater from other sites for these uses alone

- public willingness to pay for stormwater harvesting, which can be more expensive than other alternative water supplies
- unless stormwater is able to be 'banked' for periods of time in aquifers, 'backup' sources (e.g. from mains water) may be required in dry years to meet customer demand.

Stormwater can be captured and treated in surface storages (such as constructed wetlands) and, where hydrogeology is suitable, stored in underground aquifers through Managed Aquifer Recharge (MAR).

One of the advantages of this technique is that it requires considerably less 'footprint' area than surface storage, and this is particularly advantageous in urban areas with limited open space.
A significant number, although by no means all, areas of Adelaide have aquifers potentially suitable for MAR, and potential may also exist in some other areas of the State.

However, aquifer storage of stormwater (and recycled effluent) remains an emerging practice. A suitably cautionary but constructive approach is needed to ensure that MAR schemes are built and managed for the long term, and to protect the groundwater systems on which they depend.

Constructed stormwater wetlands are frequently used, even where open space is relatively limited, to improve stormwater quality before aquifer storage. Well-designed wetlands and associated landscaped areas can be developed at a range of scales and are capable of providing considerable community amenity and habitat value. However, being biological systems, wetlands take time to establish and it may be several years before it can be adequately demonstrated that their water quality is appropriate for injecting stormwater into aquifers.

Catchment management is also important, particularly for wetland MAR schemes, as some pollutants can not readily be removed from wetlands.

Additional potential stormwater harvesting sites in Adelaide have been identified (Figure 29), many in locations potentially suitable for MAR. Subject to pre-feasibility and other necessary investigations, viable projects will be prioritised for State Government support.

In 2009, the Commonwealth Government announced changes to the criteria for funding stormwater projects under its $12.9 billion *Water for the Future* program. A special call for stormwater harvesting and reuse projects was made, with funding offered on a 50:50 basis, up to a maximum $20 million Commonwealth contribution per project. To be eligible, projects must reduce demand on potable water, have a capital cost in excess of $4 million, and be carbon neutral.

Under these criteria, the State Government will be seeking funding on behalf of its partners for stormwater harvesting and reuse at the following sites:

- In partnership with the City of Charles Sturt, a new initiative in the western metropolitan area, which takes advantage of the geological suitability of this area for aquifer storage and includes harvesting and reuse projects at Riverside Golf Club, Old Port Road and Cheltenham, amongst others
- A proposal for a stormwater project to augment the western metropolitan initiative will be developed at Adelaide Airport in partnership with SA Water and Adelaide Airport Limited
- In conjunction with the City of Onkaparinga, a project in the southern metropolitan area to store, treat and reuse stormwater through the creation of an integrated system building on the Water Proofing the South strategy
- Working in the northern metropolitan area to increase the stormwater capacity established by the previous Waterproofing Northern Adelaide strategy, including:
  - a partnership with the City of Playford to construct a wetland at Stebonheath with associated distribution mains and
  - a biofiltration trial at Unity Park in partnership with the City of Salisbury
- A project at the Adelaide Botanic Garden managed by Department for Environment and Heritage to reduce the reliance of this icon site on the potable water supply
- A SA Water proposal for an aquifer storage and recovery scheme from existing wetlands and associated distribution mains at Barker Inlet.

Other sites may also be considered, subject to further assessment.

To maximise these opportunities, suitable open spaces for wetlands to store diverted stormwater need to be identified and reserved for this purpose.

Box 4: Managed Aquifer Recharge (MAR)

Managed aquifer recharge is the managed recharge of water to aquifers for subsequent recovery and use, or for environmental benefit. MAR can provide effective storage of stormwater and recycled effluent by reducing evaporative loss and providing transport and energy savings. MAR can be used for urban and rural irrigation and industrial uses. In certain circumstances MAR can be used to prevent seawater intrusion or provide environmental benefit. (*Managed Aquifer Recharge,* National Water Commission, February 2009).

For stormwater recycling via MAR to contribute significantly to urban water supplies, planning must provide for sufficient open space in proximity to stormwater drainage routes. Also, stormwater recycling opportunities can be promoted through adopting measures to slow the rate of run-off through, for example, designing 'upstream' flood storage to enable slow release for harvesting downstream, and through 'water-sensitive urban design'. In the Salisbury Council area, for example, numerous MAR opportunities have resulted from the construction of urban wetlands that were developed for stormwater quality improvement, flow management, and amenity.

Figure 30

Managed Aquifer Recharge (MAR), Aquifer Storage and Recovery (ASR) and Aquifer Storage, Transfer and Recovery (ASTR)

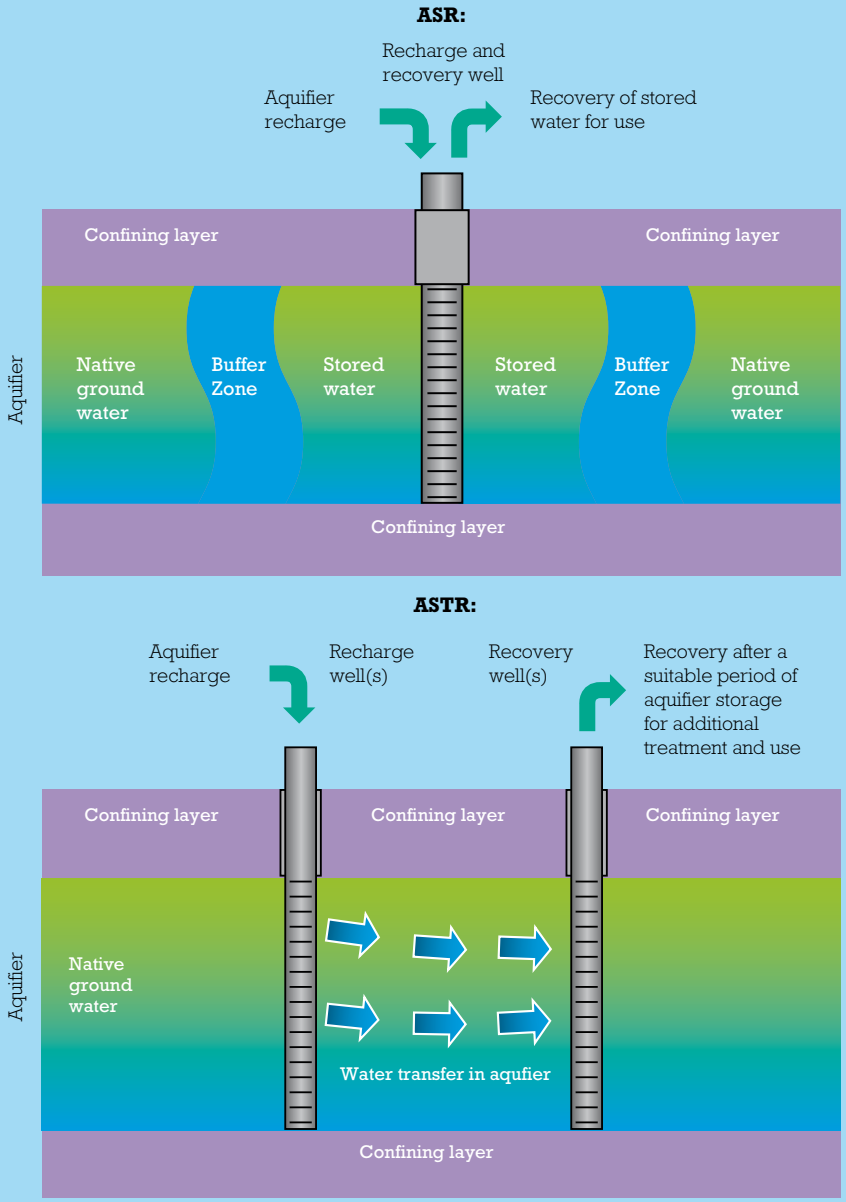
MAR can involve several different techniques, with Aquifer Storage and Recovery (ASR) and Aquifer Storage, Transfer and Recovery (ASTR) being two used in South Australia. ASR is the most common technique used in Adelaide. Various sources of water – including treated stormwater and appropriately treated effluent – can be stored in aquifers for recovery for various uses.

ASR

- relatively short aquifer residence time
- recharge and extraction point may be the same
- designed for non-drinking uses and 'third pipe' supplies
- better understood than ASTR

ASTR

- relatively long aquifer residence time
- separate recharge and extraction points
- seek to enhance supply quality



Action
Complete existing committed stormwater projects, including Cheltenham Park, to provide an additional harvesting capacity of almost 12 GL/a by 2013.

Action
Subject to Commonwealth assistance and in partnership with local government, stormwater harvesting and recycling will be underway, including:

- in the western metropolitan area including Cheltenham Park, Riverside Golf Club, Old Port Road and Adelaide Airport
- in the southern metropolitan area, building on the first stage of Water Proofing the South
- in Playford and Salisbury, creating further capacity in the northern area, building on Waterproofing Northern Adelaide
- at the Adelaide Botanic Gardens, and
- at Barker Inlet.

Action
Work with local government, the Stormwater Management Authority and other stakeholders (including the Commonwealth Government and private enterprise) to identify and develop new stormwater recycling projects in the Adelaide region, in line with the findings of the *Urban Stormwater Harvesting Options Study.*

It is appropriate that as part of each region's water supply and demand planning, a regionally-based 'vision' for stormwater be established to maximise the extent of, and benefits derived from, recycling stormwater. It is expected, for example, that Adelaide's stormwater harvesting capacity can be considerably increased through a combination of measures – including constructed wetlands and other treatment techniques, innovative use of groundwater systems (through MAR) for temporary storage of stormwater, and water-sensitive design in new developments and significant re-developments.

Action
Develop a master plan for effectively managing stormwater in Adelaide. Include interim milestones and water quality targets to support recommendations in the *Adelaide Coastal Waters Study Final Report,* to provide up to 60 GL/a of recycled stormwater, in Greater Adelaide, by 2050.

Stormwater management

Stormwater management in South Australia is complex and numerous parties are involved, including:

- the Environmental Protection Authority
- Natural Resource Management Boards
- the Stormwater Management Authority
- local councils
- SA Water.

In the interests of improving all aspects of stormwater management – including flooding, harvesting and pollution management – there is a need for greater clarity concerning the roles, responsibilities and actions required of these organisations.

Local government has the lead in stormwater management. Councils own and manage much of the infrastructure and open spaces that could be used to increase South Australia's stormwater harvesting capacity. The State does own a few assets such as the Patawalonga gates and Sturt Creek Channel. The State is also responsible for the installation of stormwater infrastructure associated with major roads. In new land divisions, developers are required to install stormwater infrastructure to the requirements of local government.

Local government has also long been a strong and vital contributor to water management, and recently commissioned the South Australian Centre for Economic Studies (SACES) to develop a report on the current and potential future role for wastewater in water management across the State. *Local Government's Current and Potential Role in Water Management and Conservation* provides contextual information for a subsequent supplementary report and recommendations. The Executive Committee of the Local Government Association has endorsed recommendations rising from the report. A number of the recommendations highlight the importance of working collaboratively with the State Government on water security, including on matters of stormwater policy, infrastructure priorities and funding. The South Australian Government recognises the importance of these recommendations and will ensure they can be progressed through actions included within this Plan.

Water Proofing Adelaide (2005) included an initiative seeking the review and clarification of responsibilities for various functions associated with managing stormwater. This included the provision of works, planning, education and regulation of water quality. Subsequently, in 2006, a Stormwater Management Agreement was entered into between the State and local government and this established objectives for stormwater management, and specified certain responsibilities and actions required of local councils, the State Government, the Environmental Protection Authority, Natural Resource Management Boards, and the Stormwater Management Authority. As part of its commitment, the Government also agreed to provide $4 million a year (indexed) for 30 years to the new Stormwater Management Fund.

In 2007, State Parliament passed amendments to the *Local Government Act 1999* that provided legislative backing for those aspects of the agreement that required statutory support, including the establishment of the Stormwater Management Authority. Importantly, the new measures also mean that local councils now develop Stormwater Management Plans in a catchment-wide context, with other relevant councils, and in consultation with their regional Natural Resources Management Board.

Local government is responsible for stormwater flood control in the respective councils and are required by the Stormwater Management Authority to produce stormwater management plans, where deemed needed.

The Stormwater Management Agreement now needs to be reviewed and updated to take account of recent developments, including:

- projections of increased urban development in growth areas, potentially resulting in more stormwater, that will need to be managed
- increased knowledge of the risks and severity of climate change and its impact on water security
- increasing community expectations concerning stormwater harvesting, healthy waterways and the protection of coastal environments
- completion of the *Adelaide Coastal Waters Study Final Report*, which identified pollutants in stormwater (and wastewater) discharges along Adelaide's coastline as the primary causes of significant loss of seagrasses
- growing local experience with managed aquifer recharge, and increasing confidence that the potential to store treated stormwater in underground aquifers in Adelaide may be considerably greater than previously considered feasible
- establishment of the Office for Water Security to coordinate overall State Government policy and action on water security-related matters, including stormwater harvesting.

In addition, some areas of the 2006 agreement, including those concerning clarity of stormwater access rights, capacity building for water-sensitive urban design, and funding aspects, require further consideration and focus.

A 2009 report undertaken for the Local Government Association of South Australia has also identified the need to update the Agreement.

This report, prepared by the South Australian Centre for Economic Studies, recommends a review of the roles, responsibilities, legislation and funding arrangements of the Stormwater Management Authority.

Action

Work with Local Government to update the State-Local Government Stormwater Management Agreement. Clarify the roles of State agencies and local government; reinforce the importance of collaboration; and strengthen governance arrangements.

Stormwater use

Stormwater collected off roofs generally contains few chemicals, other than in those areas where the atmosphere is affected very heavy traffic or industry. The quality of rainwater collected in domestic tanks may not be as good as mains water, but providing systems are well maintained, the risk of harmful organisms being present is low.

Stormwater collected off roads on the other hand is very variable in quality. It can contain high levels of litter, silt and dog droppings and dissolved chemicals such as detergents, fertilisers, hydrocarbons and heavy metals. Pathogen levels also vary markedly, being highest during the 'first flush' of the season. Aesthetically stormwater is generally more turbid and coloured than rainwater, but may be lower salinity than mains water. Stormwater can be appropriate for:

- agricultural irrigation
- landscape irrigation
- industrial use
- recreational and environmental use
- non-potable residential uses (e.g. toilet flushing)
- groundwater replenishment
- 'freshening' of wastewater for subsequent reuse (e.g. to reduce salinity levels).

Another potential option is to use highly treated stormwater to recharge to an aquifer, enabling natural groundwater to be extracted from another part of the aquifer for treatment for drinking supply. This would be made possible through a system of stormwater recharge 'credits'. This option also requires further risk assessment.

Waterproofing Northern Adelaide solution for the whole metropolitan area

In late 2008, representatives of the Waterproofing Northern Adelaide Regional Subsidiary (WNARS) presented an ambitious proposal to the Government for a major stormwater recycling scheme across the whole metropolitan area.

Box 5: Waterproofing Northern Adelaide

Waterproofing Northern Adelaide, a $100m project due for completion in mid 2010, is providing major infrastructure to integrate stormwater with other water supplies in the Northern Adelaide Plains. It is a collaboration between the Cities of Salisbury, Playford, and Tea Tree Gully, with significant support from the State and Commonwealth Governments. Participants also include the CSIRO and private enterprise.

The project involves:

- capturing and cleansing stormwater from more than 20 constructed urban wetlands
- groundwater storage, and the recovery and distribution of water for the irrigation of public spaces and industrial use
- construction of major 'third pipe' distribution pipelines
- provision of treated stormwater as a substitute for mains water, for irrigation and suitable industrial uses
- an aquifer storage, transfer and recovery research trial involving the CSIRO and others to lead to a better understanding of the ability of groundwater systems to treat injected water to a relatively high quality.

The project will also provide a substitute for water currently sourced from stressed groundwater systems, and enable local aquifers to be recharged.

Other benefits include less stormwater going out to sea through Barker Inlet, and fewer pollutants affecting Gulf St. Vincent ecosystems.

WNARS suggested that its plan could provide sufficient supply to eliminate the need to take water from the River Murray for Adelaide's drinking water supply. WNARS has an obligation, under the deed of agreement for funding from the Commonwealth Government, to demonstrate the benefits of its project. The presentation to the Water Security Council was developed in accordance with that obligation and based on a genuine desire to exchange information and share best practice knowledge.

The proposal involves harvesting up to about 100 GL/a of stormwater across Adelaide and storing it in underground aquifers, from where it would be extracted and distributed to customers via a third pipe network. The plan suggests that 37 GL/a of this amount would be used for drinking water. WNARS estimated the cost of the plan, known as *Waterwise*, could be $1.6 billion over 10 years.

The City of Salisbury also put forward a similar proposal in mid-2008.

The *Urban Stormwater Harvesting Options Study* (referred to previously) would tend to suggest that the estimated yield for this proposal may be high. Analysis of this and other augmentation options are discussed in more detail in Part 5 – The future assessment of water projects-a new approach.

Stormwater Recycling guidelines

Recently developed national guidelines provide uniformity for assessing the public health and environmental risks associated with some uses of recycled stormwater, including adding it to drinking water. However, there is insufficient evidence that augmenting drinking water supplies with highly treated stormwater is necessary in South Australia at this time. Also, there is limited data about the range of contaminants in stormwater run-off in urban catchments and this creates uncertainty regarding treatment requirements and costs.

Nonetheless, this is a long-term plan and we will remain open to the possibility of treated stormwater being used at some future time for other fit-for-purpose uses. Potential uses could include some industrial applications requiring relatively high-grade non-potable water, or residential non-potable uses (e.g. evaporative cooling and laundry use), in addition to irrigation and toilet flushing.

Through the Premier's Science and Research Fund, the State Government has been sponsoring internationally-recognised research of aquifer-based techniques for treating stormwater to a relatively high quality. However, additional research is required to adequately understand the risks, treatment processes and other issues relevant to safeguarding public health. Augmenting public drinking water supplies with highly treated stormwater cannot proceed without:

- appropriate understanding of the risks, and confidence that they can be managed
- knowledge of significant net public benefits, especially when this type of recycling is compared to other available options, such as continued use of stormwater for non-drinking purposes through 'third pipe' systems
- strong community support for the option.

At a national level, the *Australian Guidelines for Water Recycling* have been developed over the past few years. They provide a framework for assessing the public health and environmental risks of water recycling schemes. *Australian Guidelines* cover a range of water sources and uses, including stormwater, sewage and greywater, and they address the augmentation of drinking water supplies. Guidelines are also being developed for managed aquifer recharge.

Action

Update, by 2010, State water recycling guidelines to reflect the *Australian Guidelines for Water Recycling*, and include stormwater.

Roof run-off

Harvesting roof run-off and collecting it in rainwater tanks is one method of using comparatively good quality stormwater. It also helps manage site run-off. Since 1 July 2006, it has been a requirement for most new homes and home extensions in South Australia to have a rainwater tank plumbed into the home to at least one toilet, to all laundry cold-water outlets, or to a hot water service.

(Alternatively, homes may use another water supply, for example stormwater or recycled effluent, where available.) Plumbing rainwater systems into homes for such purposes encourages use during winter, when most rain falls, thereby maximising the use and value of rainwater tanks. In this situation even small rainwater tanks of around 1 kilolitre can provide almost as much supply as those with significantly larger capacity.

Typically, rainwater tanks will provide more water when used for hot water supply, rather than purely for laundry cold-water use or toilet flushing.

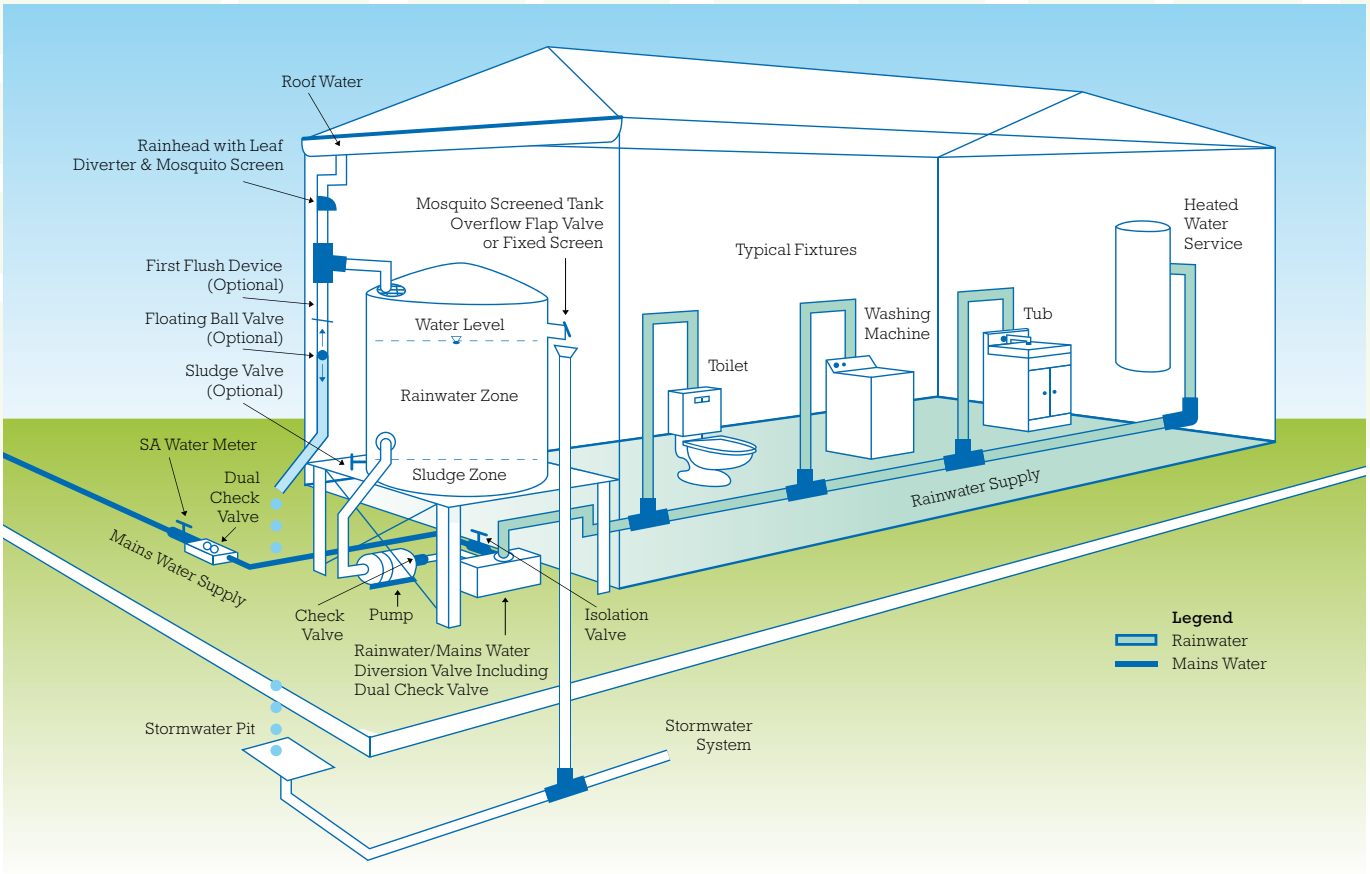
Also, roof run-off use will often be greater if the tank is connected to a large roof area. A review of existing rainwater tank requirements (e.g. the minimum roof area required to promote higher levels of supply) is warranted to determine whether there are additional opportunities for encouraging the use of roof run-off in new developments and major re-developments.

The State Government provides a rebate to encourage rainwater tanks to be plumbed into older homes as this retro-fitting can involve considerable cost. Because it is a requirement to incorporate a rainwater supply and plumbing (or appropriate alternative) into new homes, no rebate is provided as no retro-fitting costs are incurred. The Commonwealth Government and some local councils also provide rebates for installing rainwater tanks.

There are a number of options for connecting rainwater supplies to homes that are also serviced by a mains (or other) supply.

Figure 31 shows one of the most common means for connecting rainwater systems.

Figure 31
Illustration of a method for connecting a residential rainwater supply
Source: SA Water rainwater plumbing guide



Box 6: What sized rainwater tank is required?

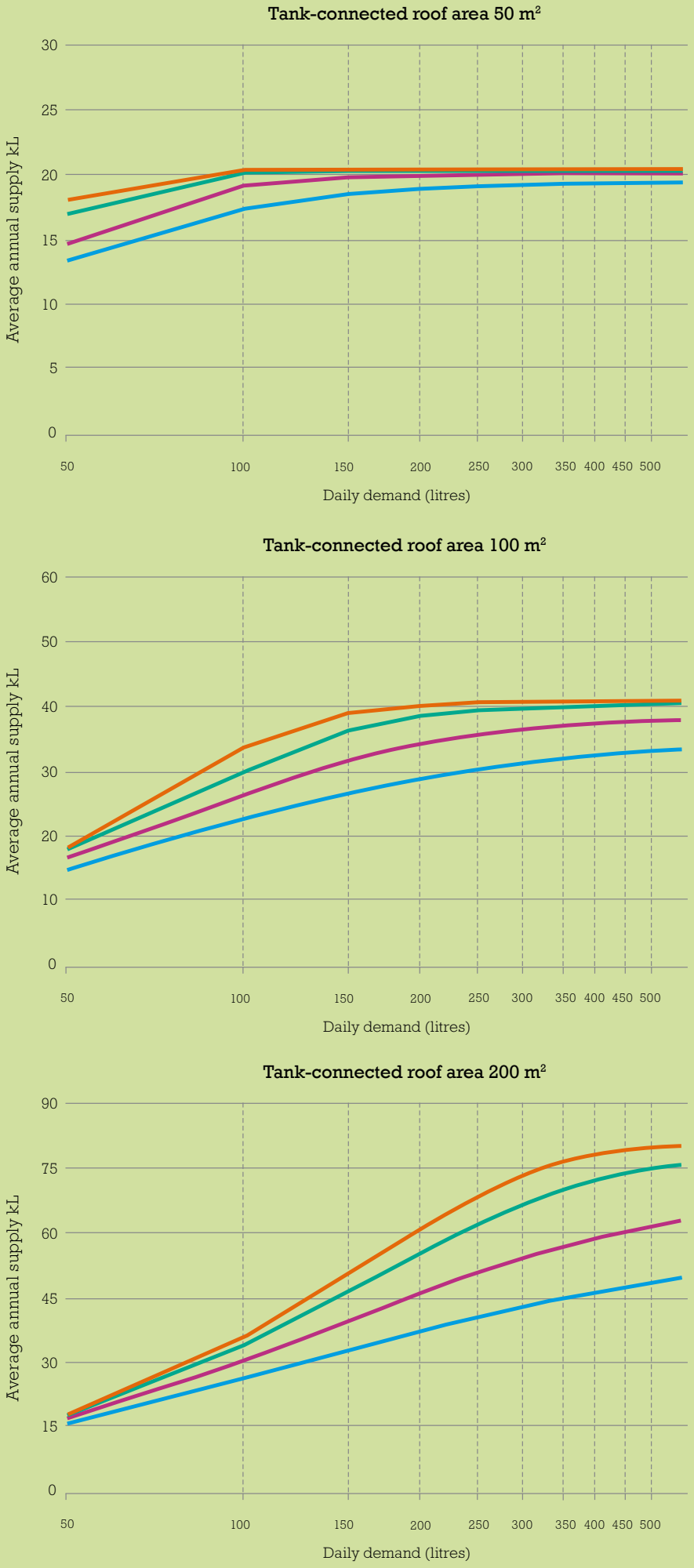
In areas where rainwater is the sole source of supply, rainwater tanks must be very large to provide for periods of low rainfall and drought. However, where an alternative supply such as mains water is also available, even small rainwater tanks sometimes save almost as much water as large tanks. The size of tank is then often much less important than:

- the amount of roof area connected to the rainwater tank. This can be increased by siting the tank near a downpipe that connects a large area of the roof
- regularly using the tank water, including in winter, by connecting the tank to an internal supply, such as a hot water service, laundry cold water outlets or a toilet. Typically, connection to a hot water service will provide more water than connection to the laundry or toilet only.

The relation between tank size, tank-connected roof area, and demand, for a region with an average rainfall of 450 mm per year, is shown in the figures below and right. For a modest connected roof area of 50 m^2 (figure right), a larger tank will typically provide little 'extra' rainwater. This is because almost 100 per cent of rain falling on the tank-connected roof area is harvested and used, even by a small rainwater tank.

Typical household daily water use (estimate):

- Toilet flushing – 60 litres per day
- Laundry cold water outlets – 100 litres per day
- Hot water supply – 150 litres per day
- Combined toilet flushing, laundry cold water and hot water – 300 litres per day
- All indoor uses – 365 litres per day.



Wastewater recycling

South Australia is a national leader in recycling wastewater. About 30 per cent of our wastewater is already reused from SA Water's wastewater treatment plants. The extent of wastewater recycling by local council owned Community Wastewater Management Systems (discussed later) is also significant – and increasing.

Wastewater is the effluent water discharged from a wastewater treatment facility after it has been treated to reduce its nutrient and bio-chemical load. State environmental standards require that disposal of wastewater to the sea and into rivers be minimised, and this has driven water authorities to look for alternative disposal options.

Given the high level of treatment it undergoes, wastewater is not technically a 'waste'. In fact, it has many practical uses similar to those of recycled stormwater. They include irrigation, industrial uses, some non-drinking residential uses (e.g. garden irrigation and toilet flushing), and groundwater replenishment.

However further increases in wastewater recycling will be limited by suitable markets (low winter demand), capital cost and water quality (many wastewaters are saline).

There is no evidence that recycling wastewater for drinking supplies is needed in South Australia, or would be more appropriate than recycling for non-drinking purposes. There is already an established market for using it for irrigation.

Various wastewaters are also produced by industries and other enterprises. A number of these have been taking steps to reduce discharges through recycling.

Domestic scale reuse, for example domestic 'greywater' (water from the laundry and bathrooms that has not come into contact with toilet wastewater), is also a potential source of water for garden use. Greywater can be reused in approved 'permanent' greywater schemes or by 'temporary' measures such as manual bucketing of greywater.

Key points

- South Australia is a leader in wastewater recycling
- Further expansion of wastewater reuse is possible in food bowl areas, new developments (dual systems) and decentralised schemes
- Use is limited, mainly by lack of winter demand, lack of storage capacity and the high salinity of some wastewaters
- Wastewater is not considered a suitable resource to recycle for drinking water.

Actions and outcomes

Outcome
Capability to recycle 45 per cent of urban wastewater by 2013.

New actions
Develop State guidelines for greywater recycling, consistent with *Australian Guidelines for Water Recycling*, by 2010

Develop a master plan for effectively managing wastewater in Adelaide, in concert with the stormwater recycling master plan, to ensure optimum use of both water sources.

Action under way
Complete wastewater recycling projects, including Glenelg to Parklands (open space irrigation), Blakeview (housing development), Southern Urban Recycling Project (housing development), by 2013.

Outcome
Capacity to recycle 50 GL/a of wastewater in South Australia, for non-drinking purposes, by 2025.

New action
Encourage decentralised wastewater recycling schemes in new developments, in partnership with the implementation of the *Plan for Greater Adelaide*.

Outcome
Capability to recycle a minimum of 75 GL/a of wastewater recycled in South Australia, for non-drinking purposes, by 2050.

New action
Expand recycling of rural community wastewater management schemes (council operated) to 12 GL/a by 2050.

Discussion

Wastewater

Sewage and industrial discharges are generated in South Australian homes, industries and businesses. Most sewage discharged from properties is managed in either large wastewater treatment plants, or by community wastewater management schemes. A significant proportion of this is already being recycled. Recycling also occurs on a small scale on individual sites through systems designed to treat septic tank wastewater. Greywater reuse is also relatively common, with the vast majority occurring through activities such as manual bucketing or diverting water from clothes washing machines.

The State Government provides full sewage collection, treatment and disposal services for metropolitan Adelaide and the major regional centres – about 90 per cent of the State's 'wastewater' population. Local government is responsible for effluent and some sewage collection, treatment and disposal services for other country towns.

Recycling from large wastewater treatment plants

According to a recent national report Adelaide recycles the highest proportion of wastewater of all Australian capital cities. South Australia recycles the second highest proportion of wastewater of any state or territory. Trends in recycling from SA Water Corporation's wastewater treatment plants (WWTPs) are shown in Figure 32 below.

The extent of recycling varies from none in some plants, to 100 per cent in others. The extent of recycling can also vary significantly seasonally, particularly where it is primarily used for irrigation.

Likewise, sewer inflows to WWTPs vary seasonally and annually, with lower flows during drier years.

During water restrictions there is a further reduction in sewer flow due to reduced water use indoors and outdoors, and increased reuse of domestic greywater. For these reasons, caution is required in interpreting annual differences in water recycling rates. The trend over a number of years provides a more accurate indication of the extent of recycling. Current projects are expected to increase the proportion of wastewater recycled to almost 45 per cent, with timing dependent upon the rate of growth in demand for the end product.

Increasing recycling above current planned rates involves significant challenges, and these will require careful consideration. Potential issues for irrigation-demand planning include the fact that:

- irrigation is primarily a summer activity, so significant winter demand, or large storage from winter for summer irrigation, will be required (storage options include surface water or aquifers)
- high-value crops, such as permanent plantings, have a more limited irrigation season, and limited demand per hectare, than turf and pasture.

Water quality is also a key issue, with a number of wastewater treatment plants producing water with salinity levels too high for some potential uses (due to saline inflows). Wastewater salinity for some South Australian plants is indicated in Figure 33. Opportunities to improve the quality of sewage entering the plants, improve the quality of treated outflows, and 'shandying', or blending, with less saline water (e.g. stormwater) require consideration. Controlled inflows of stormwater to sewer systems (where stormwater is available) may also have potential for increasing the quantity, as well as quality, of recycled water for use.

Figure 32
Trends in recycling from SA Water wastewater treatment plants

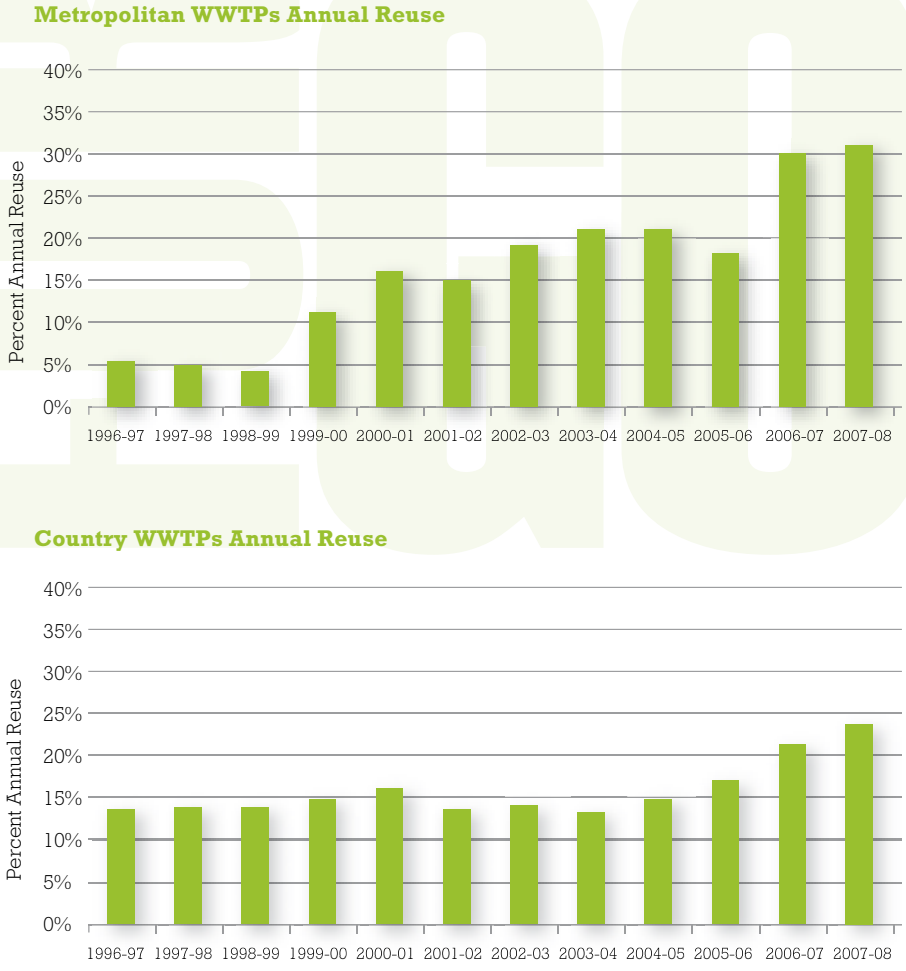
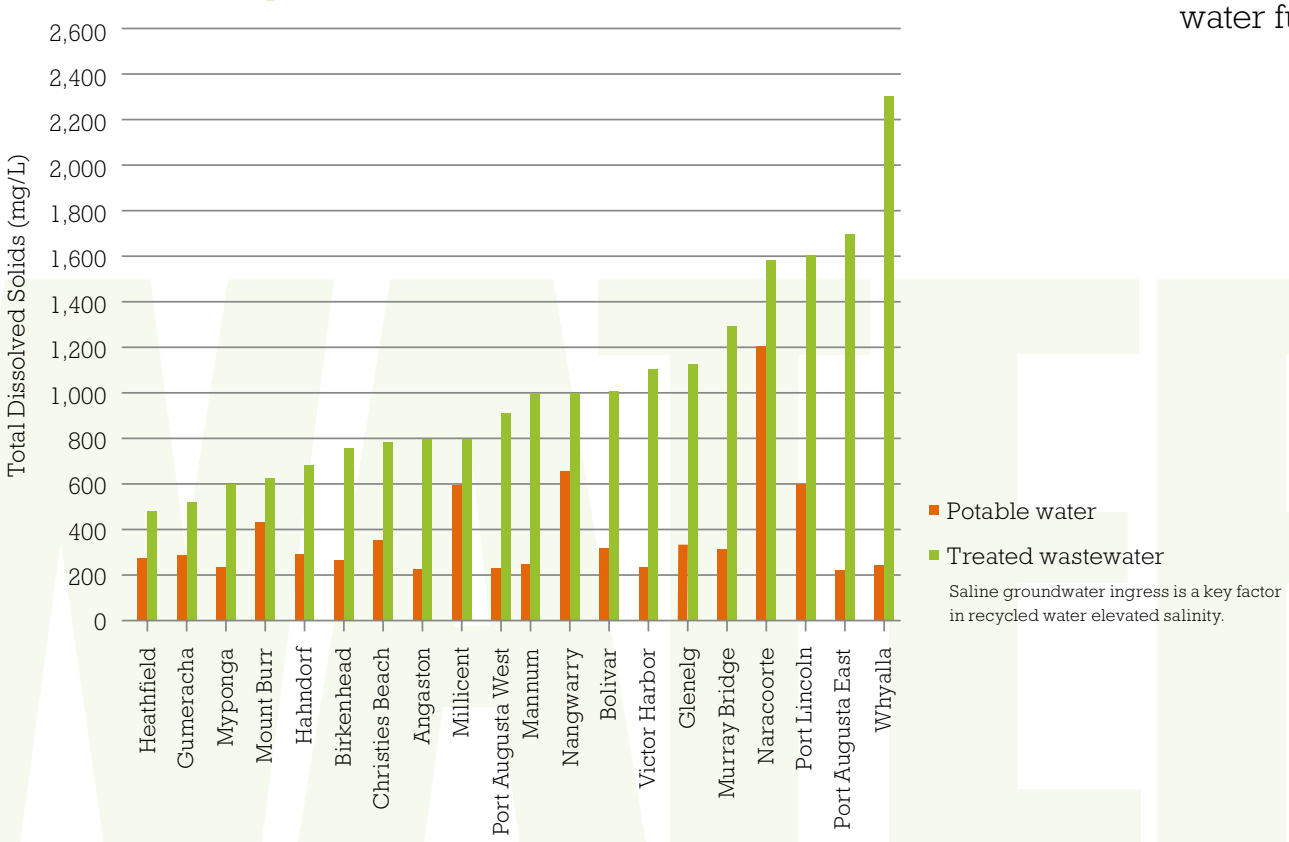


Figure 33
Salinity of local water supply and treated wastewater in SA Water wastewater treatment plants



Box 7: Sewer mining may also provide an opportunity for increased water recycling, by enabling water to be extracted at a specific point in the sewer main for treatment and use.

Sewer mining

In sewer mining, wastewater is extracted at an appropriate point from a sewer main, then treated, and reused locally. Advantages include:

- treated effluent is used in the vicinity of existing sewer infrastructure, avoiding the need for distributing recycled water back to the region from a downstream treatment plant
- the opportunity to use better quality (lower salinity) wastewater from parts of the sewer system.

Sewer mining is not appropriate for all locations. Potential for noise and odour mean that a suitable buffer distance is needed between the sewer mining site and adjacent development. Also, because solid waste from sewer mining processes is discharged back into sewers, in some situations there can be a risk of blockages in the trunk sewer.

Case example: Sewer mining in Port Augusta

Port Augusta City Council, with assistance from the State Government and SA Water, has developed an innovative sewer-mining scheme, which extracts raw wastewater from SA Water's sewerage system and treats it to produce recycled water for parks, ovals and its municipal golf course. Other benefits of the project include reduced reliance on imported mains water, and reduced discharge of treated wastewater to the marine environment.

The council, SA Water, and private enterprises have combined to use SA Water's sewerage system, with additional technology, to dewater sewage close to locations where effluent can be used. The water is regularly tested to ensure it meets guidelines for reuse.

In many cases, wastewater recyclers and stormwater recyclers could be competing for the same customers (e.g. Glenelg to Adelaide Parklands) or be able to provide a shandied water product (e.g. Mawson Lakes). A master plan for wastewater expansion schemes in Greater Adelaide would address this risk and maximise the opportunity.

Action

Develop a master plan for effectively managing wastewater in Adelaide, in concert with the stormwater recycling master plan, to ensure optimum use of both water sources.

Community wastewater management systems

Community wastewater management systems are designed to collect, treat, and reuse or safely dispose of primary-treated effluent from septic tanks on individual properties. These systems provide wastewater services for approximately 10 per cent of the population of South Australia via 172 individual schemes in 45 council districts. Schemes vary in size from small settlements with only about 10 connections, to townships with more than of 4000 connections. Approximately 10.2 GL/a of effluent is produced.

The recycling of effluent from local council community wastewater management schemes is increasing significantly as a result of the $90 million Statewide Water Recycling Project. This project, funded by local councils and the Commonwealth Government, will provide recycled water from approximately 60 local council schemes, making available approximately 8 GL/a for irrigation of public reserves, school ovals, and other suitable uses.

The State Government supports these schemes and, in July 2008, signed a long-term funding agreement with local government, which provides $3.5 million a year (indexed for inflation) until 2017. It is estimated that this will enable the accelerated rollout of new community wastewater management schemes in nearly 40 townships over the next 10 years. All new schemes will be designed to deliver recycled water for productive uses. The program will also remove the existing environmental and public health risks associated with failing septic tank systems, thus supporting the development of regional towns.

Action

Expand recycling of rural community wastewater management schemes (council operated) to 12 GL/a by 2050.

On-site recycling

Effluent can be recycled on-site – for example, by individual households in unsewered areas, and by businesses. The viticulture industry has taken a lead in processing and recycling waste. Opportunities to build on current water recycling practices can be considered as part of regional water supply and demand planning.

Greywater

Domestic greywater is a potential source of water for garden use. It can be used in approved 'permanent' greywater schemes, with assessments on a case-by-case basis. 'Temporary' measures (e.g. the manual bucketing of greywater) are also allowed and are popular during water restriction periods. There are also a number of 'pre-approved' treatment and diversion systems, for which information is available from the Department of Health.

An understanding of site characteristics, including soil type and other factors, are important considerations for permanent greywater systems. It is not possible to adequately control the quality of greywater, and therefore rules governing permanent system installations need to take account of site-specific factors.

The Department of Health uses the *Australian Water Recycling Guidelines* in assessing these systems. Another issue is the possibility that permanent systems constructed on individual sites might, at some time, be built over, either inadvertently or knowingly. This, however, is not currently taken into consideration in assessing greywater systems.

Action

Develop State guidelines for greywater recycling, consistent with *Australian Guidelines for Water Recycling*, by 2010.

Box 8: Greywater from houseboats

Greywater from vessels on the River Murray (e.g. houseboats) has previously been discharged in an untreated state back into the river, adding biological, organic and chemical pollutants. State Government regulation via the Environment Protection Authority now requires vessels to contain their greywater for pumping into land-based treatment systems. However, in a world-first approach, the on-board treatment of greywater and subsequent discharge back into the river is also now a legal option. This has been estimated to return 500 ML per year of treated greywater back into the River Murray at a quality better than that of natural river water. The on-board treatment and discharge option results in more water being returned to the river than the containment/pumping method required in other State jurisdictions. Containment or treatment of greywater reduces environmental and public health risks.

Decentalised wastewater systems

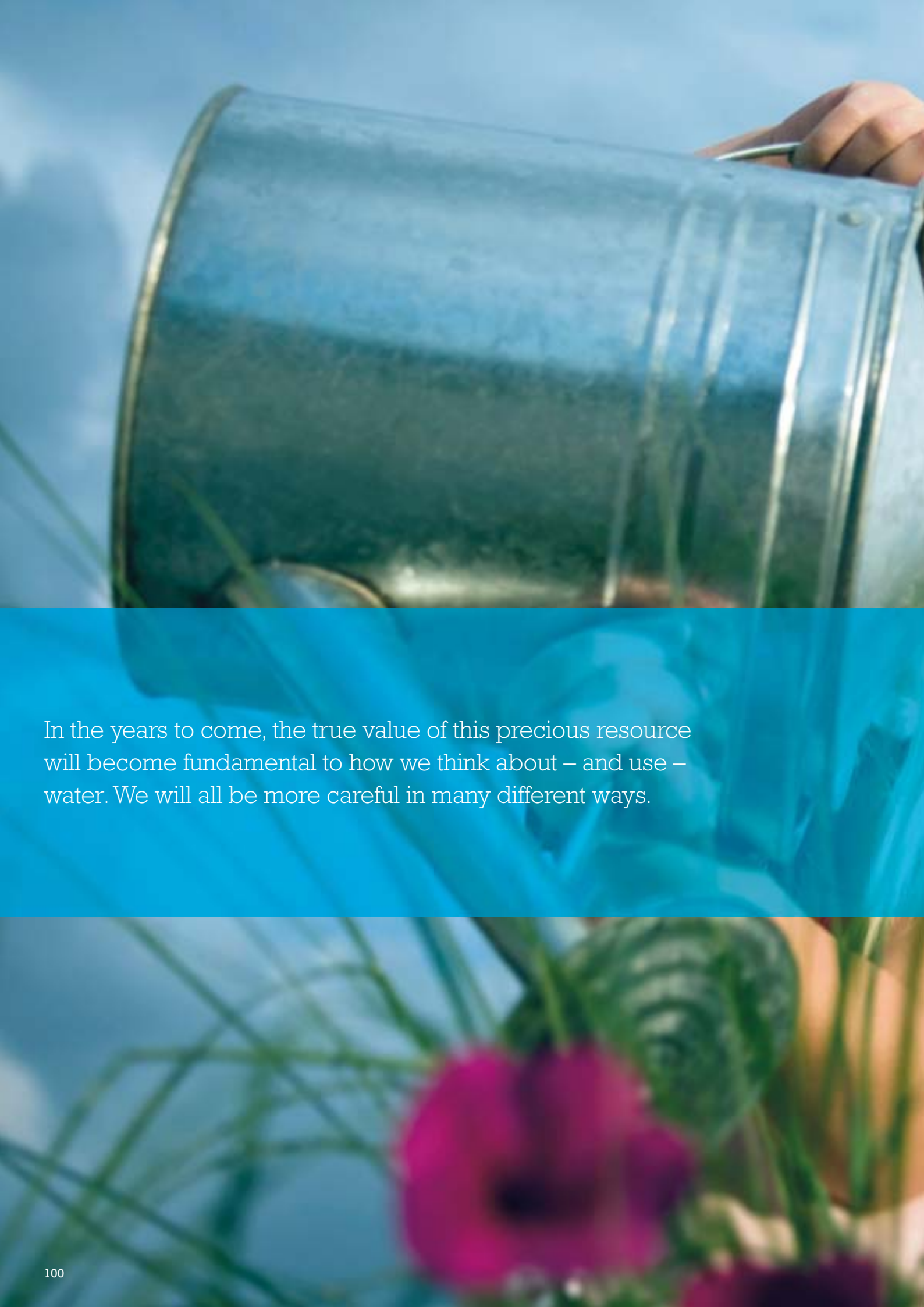
In South Australia, the approach to date has been to have a single sewer network servicing multiple suburbs or whole townships, draining to a large centralised wastewater treatment facility. However, as Adelaide and other major rural towns grow, the cost of connecting new developments at the extremities of the sewer network is becoming increasingly prohibitive.

An alternative gaining favour interstate is to install decentralised sewer networks to serve a single development, and link them to a small-package treatment plant nearby that is capable of providing high quality treated water for local reuse. This type of scheme is likely to be increasingly considered in future within Greater Adelaide and growing regional centres such as Mount Gambier.

Factors limiting the use of inland decentralised schemes include storage capacity for treated wastewater during winter, and odour control. Advances in treatment technology and aquifer storage and recovery may help address these issues.

Action
Encourage decentralised wastewater recycling schemes in new developments, in partnership with the implementation of the *Plan for Greater Adelaide*.

Purple pipes from the Glenelg to Adelaide park lands recycled water project.



In the years to come, the true value of this precious resource will become fundamental to how we think about – and use – water. We will all be more careful in many different ways.

Part 4

Managing our water future

Using and saving water

Using and saving water

Efficient water use is a vital part of our State's water security strategy. Using water efficiently and reducing our water needs will minimise the impact on existing resources and reduce the need to augment supplies in the future. Implementation of water sensitive urban design principles (water efficient fittings, recycled water for gardens) to new dwellings, coupled with water-wise behaviours will greatly lessen the draw on South Australia's water resources.

Key points

- Managing water use is essential for ensuring healthy, safe and reliable water supplies, especially during times of low availability
- Water restrictions have been effective in reducing demand for reticulated water to allow us to cope with unprecedented water shortages, but will not be a long-term measure
- South Australian households reduced their water use from 328 litres per person per day in June 2003 to approximately 228 litres per person per day at present
- We can use less water per person without necessarily adversely affecting our lifestyle, environment or the economy
- South Australians consider water to be one of the most important issues facing the State
- Future water security initiatives in the irrigation and industrial sectors need to focus on water use efficiency
- Savings can be made in the government, commercial and industrial sectors through various measures such as retro-fitting existing buildings with water efficient appliances
- A better understanding of water issues is required by all South Australians so they can make informed choices about their use of water.

Actions and outcomes

Outcomes

All householders use water wisely following the lifting of water restrictions.

Greater Adelaide has a target to use 50 GL a year less water in 2050 than would have been the case without the actions in this Plan.

New actions

Enhance the H_2OME rebate scheme in September 2009 by:

- including a new $150 rebate for the purchase of a hot water recirculator
- modifying washing machine rebates to apply to those with a minimum of $4^1/_2$ stars
- an increase in the garden goods rebate to $100 on a $250 basket of goods, which will now include rainwater diverters
- a new $200 rebate for the purchase of approved pool covers and cover rollers for existing household swimming pools

Support the expansion of the Water Efficiency Labelling and Standards (WELS) scheme to include additional products and minimum performance standards for existing products

Implement the best regulatory approach to mandate swimming pool covers by 2012.

Actions under way

Maintain permanent water conservation measures when new sources of water come on line and water restrictions can be lifted

Outcome

All water users, including industry and agriculture, applying best practice water use and management approaches.

New actions

Apply permanent water conservation measures to private bores in urban areas from 2010

Develop the Urban Landscape Program to provide South Australians with the knowledge, tools and incentives to develop appropriate water-wise gardens and landscapes by the end of 2011

By 2010, require SA Water customers using more than 25 ML a year to complete a water efficiency plan

Include leak detection in the water auditing process of the Business Water Saver Program

Work with industry to encourage the uptake of stormwater and recycled water for primary production in lieu of mains water

Irrigation meters will be installed in the Mount Lofty Ranges Prescribed Areas by 2014, once water users are licensed.

Actions under way

Extend delivery of irrigation efficiency programs, such as the Irrigated Public Open Space program, to all local councils and schools. Incorporate the identification of opportunities to substitute mains water used for community purposes with fit-for-purpose water (e.g. recycled water, rainwater and stormwater)

Implement a retro-fitting program to improve the water efficiency of publicly-owned buildings. Encourage similar water efficiency measures in buildings leased by the Government, and in other private commercial buildings where appropriate

Continue SA Water's program of leak detection and repair in its metropolitan and major country town networks and report annually on progress.

Outcome

The South Australian community has an enhanced level of awareness of water issues and has taken actions to address water issues and save water, such that we are known internationally as a water-sensitive state.

New actions

Develop a new water information website, with clear and readily accessible information on South Australia's water resources, and information to help South Australians improve water-use practices by the end of 2009

Develop an awards program, including a Premier's award, to recognise the achievements of communities, individuals, schools, businesses, industry and government that are contributing to our future water security by the end of 2011

Work with the South Australian Multicultural and Ethnic Affairs Commission to develop targeted water education programs with the various ethnic communities of South Australia.

Actions under way

By 2010, expand water education to raise awareness among South Australians of key water issues through a **Water for Good** education campaign

Provide SA Water customers with more information on their water bills, including comparisons with previous use, and use in similar homes

By 2013, develop further curriculum resources to help lower and middle school students learn more about water resources, the water cycle, and what can be done to reduce water use.

Discussion

Responsible water use will continue to be an integral part of managing our water security. While most users have responded well to conservation measures and restrictions, the State as a whole must strive for best practice use and management.

Table 7
Target reduction in potable water use for user groups in Greater Adelaide, by 2050, through actions in this strategy

Sector	Forecast water use by 2050 without any demand management measures (GL/a)	Forecast savings by 2050 with demand management measures (GL/a)
Household Uptake of water efficient products (10), expanded WELS (5), Building regulations (8), Landscape garden program (7), Pool covers (2), Education (3)	242	35
Commercial and industrial Business saver program (3), IPOS (1), Government buildings (5), Leakage management (2)	55	11
Agriculture Wastewater substitution, metering (4)	36	4
Total target water savings	**333**	**50**

A comprehensive review has been undertaken of demand management programs interstate and overseas, together with an analysis of the relative costs and benefits of various demand management measures. As a result, a further suite of actions – in addition to those already in place – has been developed. It is estimated they will save a further 50 GL/a of potable water in Greater Adelaide by 2050, from a pre-water restriction base. Measures include the $24 million rebate package for household users and, for larger-scale users – including agricultural, commercial and industrial – the implementation of water efficiency plans and other voluntary measures.

Quick fact: It is estimated that low flow showerheads are 20 to 25 per cent more efficient than conventional showerheads. They can save an average household more than 11 kL/a.

Water restrictions and permanent water conservation measures

Across Australia, most capital cities have developed, implemented and operated some form of water restriction or water use targets, either due to drought or demand exceeding system capacity. These restrictions are temporary with varying levels of severity depending on circumstances.

Studies show that while restrictions result in significant water and cost savings across all consumer sectors, they also result in additional, longer-term benefits. Primarily, they lead to changes in consumer behaviour and spur innovation in water-efficient technologies and methodologies.

In South Australia, temporary water restrictions were introduced first on Eyre Peninsula, in 2002. Level 2 water restrictions were introduced for all SA Water customers using water from the River Murray and Myponga Reservoir in July 2003. Permanent water conservation measures replaced Level 2 water restrictions in October 2003, and applied to all SA Water customers.

Enhanced Level 2 water restrictions were introduced for all River Murray potable supplies in 2006, to reduce demand during the drought. Since then, varying levels of restrictions have been applied elsewhere, depending on region and changing circumstances.

Implementation of the range of initiatives contained in this Plan should, by the end of 2012, have ensured that severe water restrictions (greater than Level 2) should not be necessary more than once in every 100 years.

The following permanent water conservation measures will, however, remain in force beyond 2012:

- not watering gardens by sprinkler during designated hours
- no hosing down of external paved areas
- washing of car or boat by hose with a trigger nozzle
- dust suppression on building sites by hand-held hose or tanker only.

Action

Maintain permanent water conservation measures when new sources of water come on line and water restrictions can be lifted

Permanent water conservation measures up until now have only applied to SA Water supplies. Given that they represent good water-use practices, there is a case for them applying to other water sources, in particular groundwater. This would overcome an obvious anomaly in parts of the State, such as in the South East, where both SA Water and private bore operators draw from the same aquifer. In Adelaide, SA Water does not use groundwater for its potable supply. However ensuring this resource is used wisely is vital, as any loss would place additional demand on the mains supply. In addition, all water sources, including the groundwater accessed through bores, should be valued and used wisely.

Action

Apply permanent water conservation measures to private bores in urban areas from 2010.

Reducing water use in and around the home

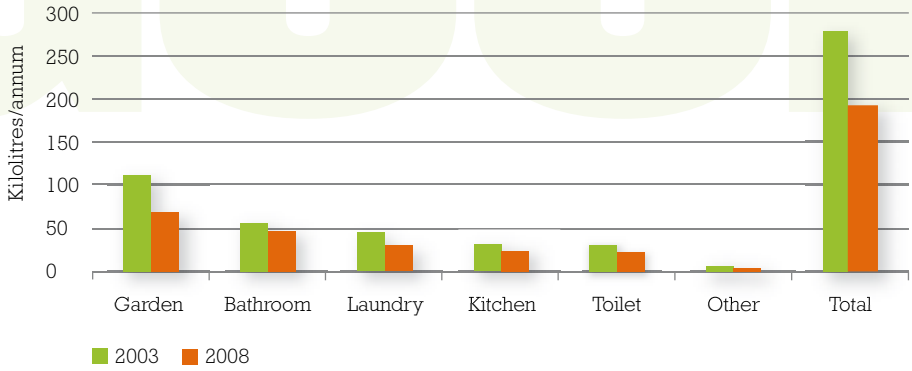
Responsible household water use involves using water more efficiently while meeting domestic, individual, lifestyle and amenity needs.

63 per cent of mains water is used for household purposes. *Water Proofing Adelaide* in 2005 identified household water use as a key area for savings. Specific strategies were introduced, including implementing the Water

Figure 34

Breakdown of how water is used in the home before and after the introduction of water restrictions

Source: Water Proofing Adelaide 2005 and Office for Water Security 2009



Efficiency Labelling Scheme (WELS), promoting the Smart Water Mark scheme, regulating the installation of rainwater tanks, investigating ways to make new homes more water efficient, and promoting water conservation through education and conservation programs.

South Australians have reduced their annual water consumption from 280 kL per property in June 2003 (*Water Proofing Adelaide 2005*) prior to water restrictions to 193 kL per property in June 2008 (*SA Water Annual Report 2008*).

Not surprisingly, the majority of savings have come from a reduction in outdoor water use. Nevertheless, incremental savings have also been achieved within the home through the greater use of water-efficient fittings and the adoption of water-saving behaviours.

The H_2OME Rebate Scheme

A $24 million rebates package introduced by the State Government in November 2007 has helped and encouraged households to reduce water consumption both inside and outside. Ongoing uptake of water efficient appliances and products such as those supported by the H_2OME Rebate Scheme through to 2050 would result in water savings of about 10 GL/a from the residential sector.

Since the inception of the Rainwater Tank and Plumbing Rebate Scheme (1 July 2006), more than 6000 rebates – worth $3.9 million – have been granted. Rainwater tanks offer many benefits, including reducing annual water bills through decreased mains water consumption and mitigating the effects of water restrictions on lifestyles. The increase in rainwater tank installations indicates that householders are willing to bear some costs in order to maintain their ability to use water. This has been further boosted by the $250 million *National Rainwater and Greywater Initiative*.

The rebate on water-efficient washing machines has also been popular. They can save between 70 and 170 litres of water per load, or the equivalent of up to 20 kL/a per household. Over 62,000 rebates have been claimed since rebates began in 2008. The demand is such that the marketplace now only offers water efficient models. Consequently, the rebate will be modified to apply to water efficient washing machines of $4^1/_2$ stars and above.

Overall, South Australians have embraced the various rebates available, and a total of more than 91,000 have been granted. Table 8 outlines the uptake of the rebates to June 2009.

Table 8
Rebate uptake in South Australia (as at 1 June 2009)

Rebate	Number granted since 1 November 2007	Approximate value
Garden goods	12509	$625,430.00
Showerheads	5986	$170,261.39
Washing machines	62245	$12,448,116.55
Dual-flush toilets	5575	$839,821.45
Rainwater tanks	4743	$3,311,194.84
Home water audits	47	$4,644.75
Total	**91105**	**$17,399,468.98**

Building on this success, the existing rebates package will be revised over the coming years and consumers will be offered targeted incentives to reduce water use in and around the home.

The enhancements will include:

- a $150 rebate for hot water recirculators which, when attached to internal hot water pipes in the supply line ahead of device outlet points (such as showerheads), divert water below a pre-set temperature back to the hot water tank so that wastage of cold water is avoided
- rebates up to $100 on a $250 basket of outdoor goods, including rainwater diverters (The current rebate is $50 on $150 worth of goods)
- rebates for garden water efficiency assessments, water efficient advice and landscape plans after water restrictions are lifted
- a rebate of $200 for the purchase of approved pool covers and cover rollers for existing household swimming pools

Quick fact: Hot water recirculators can be installed in new homes and retro-fitted into existing properties for approximately $1000. They can save up to 45 litres per day.

Action

Enhance the H_2OME rebate scheme in September 2009 by:

- including a new $150 rebate for the purchase of a hot water recirculator
- modifying washing machine rebates to apply to those with a minimum of 4½ stars
- an increase in the garden goods rebate to $100 on a $250 basket of goods, which will now include rainwater diverters
- a new $200 rebate for the purchase of approved pool covers and cover rollers for existing household swimming pools.

The current rebates program is funded until 2010-11.

Swimming pools

Swimming pools are a lifestyle choice for around eight per cent of South Australian households. They can also be large water users – losing up to an estimated 60 kL of water each year from evaporation alone if a pool cover is not used.

South Australia has a relatively low number of swimming pools compared to other states and territories; however, the proportion of households with pools is growing – doubling between 2001 and 2007. As the population grows and temperatures increase, more households are likely to want a pool.

Pool covers can significantly reduce water loss from evaporation, if used correctly. If all pool owners used a cover, an estimated 2 GL/a could be saved by 2050.

Under enhanced level 3 water restrictions, pool covers are required in order to obtain a permit to fill a pool.

Action

Implement the best regulatory approach to mandate swimming pool covers by 2012.

Water Efficiency Labelling and Standards Scheme (WELS)

National mandatory water efficiency labelling and standards (WELS) were introduced in South Australia under the *Water Efficiency Labelling and Standards Act 2006*. All showerheads, washing machines, toilets, dishwashers, urinals and some types of taps must now be WELS labelled. The WELS scheme also sets minimum water efficiency standards for toilets, and encourages voluntary water efficiency labelling on flow-control devices.

The introduction and expansion of the H_2OME rebate scheme will accelerate the uptake of WELS labelled water efficient products.

Following its initial success, WELS is now being expanded to include additional products, and minimum performance standards for existing products are being introduced. New products being investigated for the scheme include:

- evaporative air-conditioners
- instantaneous gas hot water systems
- domestic irrigation controllers
- hot water recirculators.

New minimum water efficiency standards will be set for clothes washing machines, taps, dishwashers, combination washer/dryers, showers, urinals and other products. The minimum standards for toilets will be raised.

Action

Support the expansion of the Water Efficiency Labelling and Standards (WELS) scheme to include additional products and minimum performance standards for existing products.

Improving water use efficiency in new homes

Since 1 July 2006, South Australian building regulations (Regulation 83A of the *Development Regulations 2008*) have required new dwellings and extensions, or alterations greater than 50 square metres, to include an additional water supply to supplement the mains water. (Some remote towns are exempt from this requirement.)

Installing a rainwater tank is the most common way of complying with this requirement, however other approaches (e.g. third pipe recycled water) are also acceptable. Rainwater tanks must have an overflow device, and a mosquito-proof, non-degradable screen to protect the water quality. The additional water supply must be plumbed to a toilet, to a water heater or to all cold-water outlets in the laundry of a new or altered home.

In addition, shower outlets connected to a new or replacement water heater need to be water efficient.

As the per centage of houses fitted with these water saving devices increases (new homes and redevelopments), permanent water savings of up to 8 GL/a could be achieved by 2050. With a forecast additional 260,000 homes to be constructed in Greater Adelaide by 2050, the opportunity exists to greatly increase the proportion of water efficient homes.

Urban Landscape Program

Many South Australians highly value their gardens and are feeling the impacts of ongoing dry conditions and resultant water restrictions. Some households have replaced plants with more water efficient species, others are using alternative water sources, such as groundwater, rainwater and greywater to maintain the garden.

As well as providing rebates for water-efficient garden goods, the South Australian Government is working closely with the nursery industry and has introduced a range of ongoing community education initiatives to encourage the wise use of water in the garden. These existing initiatives are estimated to reduce domestic water use by 7 GL/a by 2025.

Many South Australians have looked at alternatives to the traditional garden style – in particular, seeking water-wise alternatives to large lawn areas. Decisions to replace lawn areas need to be seen in light of the many costs and benefits that lawns can bring and are largely a personal choice. In the future, a range of options will be explored as part of a holistic approach to gardening in urban landscapes. It has been estimated that if Greater Adelaide replaced a significant proportion of domestic lawns with alternatives, more than 10GL/a could be saved by 2050.

Quick fact: The SA Water Mediterranean Garden at the Adelaide Botanic Garden demonstrates how careful plant selection and thoughtful garden design can create stunning garden displays and use water wisely.

An Urban Landscapes Program will be developed and is likely to include:

- accreditation and training for landscapers and the garden industry in water-wise garden planning
- a website for planning a water-efficient garden
- awards for water-wise gardens
- demonstration gardens in new housing developments and existing homes
- a community education campaign.

To support these initiatives, SA Water, in partnership with Irrigation Australia and Horticulture Australia, is investigating further measures to increase the efficiency of outdoor urban water use.

Action

Develop the Urban Landscape Program to provide South Australians with the knowledge, tools and incentives to develop appropriate water-wise gardens and landscapes by the end of 2011.

'Water for Good' education program

Improving the efficiency of how we use water, with the aim of reducing consumption, is critical to ensuring a water-secure future. All South Australians will need to use water wisely in both wet and dry periods. Improved education and community involvement will be essential to support the range of measures to reduce water use outlined in this Plan. A **Water for Good** education program will:

- raise awareness and improve understanding of water supply and demand issues
- provide tools and information to enable all South Australians to make wise choices about water efficiency
- support and recognise individual efforts to reduce water use.

Creating a sustained and long-term commitment to reducing water use will require all South Australians to have a relatively high level of understanding of water issues and the capacity to make appropriate behaviour choices. Such behavioural change should lead to water savings. While difficult to quantify, a modest 5 kL/a saving by every household in Greater Adelaide would save 3 GL/a by 2050.

Action

By 2010, expand water education to raise awareness among South Australians of key water issues through a **Water for Good** education campaign.

Improving the community's understanding of water issues

A critical component of improving our understanding of water issues and having the ability to make informed choices is access to accurate, sound information. All South Australians need easy access to information about their local water resources, their own water use and what they can do to be water efficient. Many government and non-government agencies offer a wealth of information, however, it is often difficult to obtain. A water information website, with links to other useful sites, will be developed as part of the **Water for Good** education campaign.

Action

Develop a new water information website, with clear and readily accessible information on South Australia's water resources, and information to help South Australians improve water-use practices by the end of 2009.

The *National Water Initiative* includes a number of reforms aimed at increasing water efficiency in urban areas. One relates to the development of national guidelines for customers' water accounts. SA Water will be introducing a new 'Smart Bill' from mid 2009. These improved bills will provide information which will allow customers to make more informed choices about their water use in and around the home. They will include information about water and about services provided by SA Water, a breakdown of daily water consumption, and a comparison with similar households. In addition, quarterly billing will be introduced to give SA Water customers more timely information about their water use.

Action

Provide SA Water customers with more information on their water bills, including comparisons with previous use, and use in similar homes.

Schools

It has been long recognised that educating our school students about water issues is critical to achieving long-term changes in community understanding.

Programs such as *Waterwatch, Frog Census* and *WaterCare* have been popular with many schools for a number of years. The regional Natural Resources Management Boards continue to support these programs, as well as others, as part of their education focus.

More recently, many schools have participated in the *Australian Sustainable Schools Initiative (AuSSI)*. This is a partnership between the Commonwealth, state and territory governments, and it aims to help schools and their communities become more environmentally sustainable. *AuSSI* involves participants in a whole-of-school approach, and gives them real-life learning experiences through exploring improvements in their school's management of resources and facilities, including energy, waste, water, biodiversity, landscape design, products and materials.

SA Water is also active in supporting and educating school students. The SA Water Learning Centre and the *2009 School Education Program* help to educate students about water issues. More needs to be done to develop appropriate, useful resource materials.

Action

By 2013, develop further curriculum resources to help lower and middle school students learn more about water resources, the water cycle, and what can be done to reduce water use.

Working with ethnic and Indigenous communities

South Australia's population is characterised by a great diversity of languages spoken, systems of belief, culture and family types. Approximately one in five South Australians was born overseas, with about half of this group born in countries where English is not the dominant language.

South Australia's indigenous people have extensive localised knowledge of the land and water. We will continue to work with them to make the best decisions about our water resources.

Many of our residents were born in parts of the world where the climatic conditions, including rainfall patterns, meant that extensive watering was not needed to maintain their gardens of choice. It is important that information about wise-water use in homes, gardens and industries is accessible and relevant to all members of our diverse community.

Among the groups from non-English speaking countries, the largest communities in the State comprise those born in Europe and Vietnam. The most common languages spoken here other than English are German, Greek, Vietnamese, and Chinese. There has been, and will continue to be, changes to the make-up of languages spoken in South Australia, with Hindi (India) rising by 105 per cent, Mandarin Chinese by 127 per cent and Korean by 210 per cent.

Box 9: SA Water's Learning Centre

The Learning Centre, launched in early 2009, is an interactive learning facility located in SA Water's sustainable building in Victoria Square, Adelaide. The centre has been designed to create an inspiring space for learning about water and it uses the latest interactive technology. It aims to provide programs and events that help improve the community's water literacy.

The centre is a flexible, multi-purpose space that encourages all visitors to learn in a fun and interactive way. It can be used for professional seminars and community presentations, through to school education programs and exhibitions.

Special design features include:

- interactive floor (touch-sensitive digital fish pond)
- touch screen technology
- fish tanks displaying native freshwater fish, including live Murray Cod and the endangered Purple Spotted Gudgeon, and promoting the need to conserve them.

As a result of the diversity in culture and languages spoken, many parts of our community are not exposed to mainstream communications about water issues and this limits their ability to effectively reduce water use. In response to these challenges, SA Water prepares information in various languages and is currently developing programs for new migrants and Aboriginal communities.

Successful programs interstate have engaged ethnic communities and reduced their water use. The example in Box 10 below provides an example of a successful program targeting ethnic communities across Sydney. The most successful programs interstate have been developed by government agencies and local community leaders, in partnership.

Targeted programs using local leaders, indigenous leaders and focusing on local events and ethnic media, will be developed in partnership with the South Australian Multicultural and Ethnic Affairs Commission.

Action
Work with the South Australian Multicultural and Ethnic Affairs Commission to develop targeted water education programs with the various ethnic communities of South Australia.

Reducing water use by commercial and industrial businesses

The Business Water Saver Program – water efficiency planning
Commercial and industrial users include manufacturers, retail traders and office buildings, 80 per cent of which are located in and around Adelaide. The manufacturing industry contributes more than $6.6 billion a year to the State's economy (2001-02 ABS).

Commerce and industry uses approximately 15 per cent of the total mains water consumed – about 31 GL/a (SA Water 2005-06). Approximately 10 GL/a of local groundwater is also used (DWLBC 2006), most notably by large industry (3.7 GL/a), small-to-medium industry (2 GL/a) and golf courses (1.9 GL/a). It is important that these groundwater resources be sustained for more than their environmental value, should they no longer be available, another 10 GL/a would have to be found from the potable system.

Box 10: NSW ethnic communities Home Water Action Program
The Home Water Action Program is a joint initiative between the Ethnic Communities' Council of NSW, the NSW Department of Water and Energy, the NSW Department of Environment and Climate Change, and Sydney Water. The Project is training 18 bilingual educators to deliver Home Water Action planning workshops and events, and recruit water ambassadors within the Arabic, Cantonese, Greek, Italian, Korean, Mandarin, Macedonian, Spanish and Vietnamese communities. This program builds on the water education component of the Ethnic Communities Sustainable Living Project, which delivers culturally appropriate education for sustainability within the eight largest ethnic community groups in the Greater Sydney area.

The 18 bilingual educators are delivering workshops and training sessions, in appropriate languages, to more than 1000 residents within their community groups. The workshops are based on the Home Water Action Educator Kit and focus on developing action plans and conserving water within the home. The educators encourage and demonstrate behavioural changes that can result in a reduction in the consumption of potable water within the home. Bilingual participants are also invited to take on a voluntary role as 'water ambassadors'. To date, 45 water ambassadors are helping to deliver the program to a wider audience within their communities. An educator's resource kit is also being developed and will be made available for other community educators to encourage adaptation and implementation of the program.

Recent analysis suggests industrial and commercial users can still cost-effectively reduce overall water use by approximately 10 per cent (about 3 GL/a) through a number of measures – although the main need, given the importance of this sector to economic prosperity, is to ensure that any water that is used, is used efficiently.

Saving water can reduce costs and improve economic, environmental and social sustainability for everyone. SA Water developed the Business Water Saver Program in 2007 as part of the *Water Proofing Adelaide* initiative and delivers on-site water efficiency audit programs to large industrial users. Customers who use more than 50 ML/a have been required to participate.

Industrial and government users of over 50 ML/a have been required to prepare a water efficiency plan that identifies where they can make savings in any area of their operations where water is used. Businesses using less than 50 ML/a can also access assistance to improve water efficiency through the program. It also helps commercial and industry sites fulfil their Trade Water Effluent Improvement Program requirements and water efficiency audits are also conducted at schools using more than 2 ML/a.

As at March 2009, more than 939 water efficiency plan audits had been completed, involving 69 businesses, 527 schools and 343 Government agencies.

Water savings in the order of up to 10 per cent could be achieved, and SA Water will continue to work with these customers to reduce water use further.

Quick fact: Commercial and industrial users can save water by repairing leaks, improving the efficiency of cooling towers (which use up to 40 per cent of a building's water) and recycling fire system water, stormwater, greywater and rainwater.

The *Business Water Saver Program* will continue, and its auditing and water efficiency plan requirements will be extended, by 2010, to include users consuming more 25 ML/a. The program will also include leak detection audits. Large water users will be encouraged to install sub-metering devices so they can identify exact consumption within different areas of their operations, set alarms for high use, and identify leaks. Smart metering – continuous and remote reading of water use – will be expanded in this sector.

Smart or advanced metering is a new way of measuring and managing energy and water use. It involves two important elements: a meter that is able to capture usage information over short time intervals, typically 30 minutes or less; and a communication system, preferably two-way, that can transmit the usage information to the service provider in real time and receive control instructions. It not only provides useful data on usage patterns but can also help detect leaks. To date, smart metering has not been introduced into South Australian households but, given its success in the energy sector, the Government is undertaking trials of 'smart meters' in the Adelaide metropolitan area. The high cost of smart metering may limit their introduction to large water users.

Action
By 2010, require SA Water customers using more than 25 ML a year to complete a water efficiency plan

Action
Include leak detection in the water auditing process of the Business Water Saver Program.

Greening of Government buildings
State Government building management is guided by ecologically sustainable development principles. With respect to water, this means:

- implementing water-efficient landscaping design and irrigation systems
- considering innovative stormwater management and reuse technologies
- using innovative wastewater minimisation and reuse technologies
- installing water-efficient technologies, appliances, fittings and devices (e.g. flushing devices, flow controls and waterless urinals)
- installing water usage monitoring and reporting devices
- controlling contaminated run-offs from site works (e.g. car parks).

Measures have recently been implemented to improve energy and water efficiency in public buildings using the NABERS (National Australian Built Environment Rating System) energy and water-rating tool as a guide. A fit-out guide for buildings makes specific reference to water saving initiatives and the Water Efficiency Labelling and Standards scheme.

The Government is also a major tenant of privately-owned buildings in South Australia. A standard form of 'green lease' is being developed and this will set minimum water and energy efficiency requirements for buildings the Government completely or partially leases.

The new SA Water House in Adelaide sets the benchmark in environmentally sustainable design. It is the first building in SA – and the largest commercially developed building in Australia – to be awarded a 6-star Green Star Office Design rating from the Green Building Council of Australia.

The building has a minimum of 4-star ratings on taps, toilets and waterless urinals, uses 70 per cent less mains water than conventional office buildings, uses recycled water and rainwater for toilets.

In line with the ecologically sustainable principles outlined above, the Government will introduce a retro-fitting program for all publicly-owned buildings, where appropriate. Measures will include:

- meter installation, including sub-meters if applicable
- use of flow-controlled showers and taps
- installation of dual smart flush toilets and, where technically feasible, waterless urinals
- rainwater harvesting to supplement toilet flushing and/or outdoor water use, where technically feasible
- water-efficient landscaping.

It is estimated that this retro-fitting program for all publicly owned buildings could save up to 5 GL/a by 2025.

Action
Implement a retro-fitting program to improve the water efficiency of publicly-owned buildings, and encourage similar water efficiency measures in buildings leased by the Government, and in other private commercial buildings where appropriate.

Improving water use efficiency in public spaces.

Approximately 25 GL (13 per cent) of all mains water consumed in Adelaide is used for public purposes, including public buildings, universities, schools, public parks and gardens, sporting grounds, places of worship and hospitals. The majority of this water is used to maintain amenity, particularly in parklands, open spaces and gardens. A significant amount of water is also taken from groundwater or surface water resources for community purposes. Improving water efficiencies, including using alternatives such as recycled water, could reduce the demand on these resources. Of the total water used for public purposes, the irrigation of parks, gardens, ovals and sports fields accounts for approximately 15 GL/a. In March 2008, the State Government introduced the *Code of Practice for Irrigated Public Open Space* (IPOS). IPOS provides the tools and reporting models to implement best practice irrigation management in the provision of open spaces such as sports fields, parks and reserves. Approximately 56 per cent of South Australian councils have indicated that they implemented IPOS, which has resulted in up to 30 per cent water savings for participating councils. IPOS will be reviewed and expanded to encompass all local councils and schools, and include the identification of opportunities to substitute mains water with alternative water sources. A further 1 to 3 GL/a is expected to be saved through this initiative. There are many viable alternatives to traditional lawn in public spaces, which, in most cases, could save water and reduce the costs of maintenance.

Nearly half of all South Australian councils (46 per cent) also participate in the ICLEI – *Local Governments for Sustainability Water Campaign.* Through which they are reducing their water consumption and improving local water quality.

Action
Extend delivery of irrigation efficiency programs, such as the Irrigated Public Open Space program, to all local councils and schools. Incorporate the identification of opportunities to substitute mains water used for community purposes with fit-for-purpose water (e.g. recycled water, rainwater and stormwater).

Reducing water supply system losses

South Australia has over 25,000 km of water mains, 8,600 km of which is located in metropolitan Adelaide. Water for Adelaide is collected from the Adelaide Hills catchments by a series of 10 reservoirs that are supplemented by transfers from the River Murray via two major pipelines. The water is transmitted to eight water treatment plants, and supplied to customers via a distribution network.

It is estimated we lose about 7 per cent of the water supplied from our metropolitan system each year. In addition, up to 14 GL evaporates annually from the surfaces of water supply reservoirs in the Adelaide Hills, depending on the water levels in the reservoirs and climatic conditions.

SA Water detects and repairs leaks on an ongoing basis. In 2005-06, it recorded the lowest water loss per connection of all major capital city water utilities. It is nevertheless seeking to further improve its record and recently began an $8 million project to detect leaks within the metropolitan Adelaide region. The project will run to 2010-11 and seeks to achieve savings of between 1 and 5 GL once identified leaks are repaired. For the longer term, it has 25-year plans for mains replacements, using models based on asset lives and burst history.

Our challenge is to continue to reduce any system losses and ensure all water is properly accounted for.

Action

Continue SA Water's program of leak detection and repair in its metropolitan and major country town networks and report annually on progress.

Agricultural water use

Irrigation in South Australia

The gross value of agricultural production in South Australia in 2005-06 was approximately $3.5 billion. This represents approximately 11 per cent of the total gross value of Australian agricultural production.

In a normal year, agriculture is by far the largest user of water in South Australia and even relatively small savings in this sector can result in significant water savings. In 2006-07, approximately 75 per cent of South Australia's water – 1034GL (source ABS) – was used for primary production. This reduced to 933GL in 2007-08.

In South Australia, there are approximately 6500 irrigators, and 201,000ha of irrigated land.

Significant agricultural industries include wine grapes, orchards, vegetables and farm forestry, as well as dairying, livestock, poultry, commercial fisheries and freshwater aquaculture.

Climate change, increased salinity and reduced river flows pose major challenges and costs for the State's agricultural producers and their communities, particularly in the River Murray corridor.

The *Garnaut Climate Change Review 2008* estimated that, as a result of climate change, unchanged practices in the agriculture sector would lead to the loss of half the irrigated output from the Murray-Darling by 2050. The formidable challenges involved in turning this around have already generated intense community discussion.

The ability to extract more water in many existing agricultural areas is limited, with most water resources being used at or above their sustainable limit. Agricultural improvements, such as improved irrigation efficiencies and practices, and improved land uses, have already contributed to water savings and increased production across much of the State, particularly in the Riverland.

Legislative provisions exist to improve water efficiencies in the agricultural and horticultural sectors. Water Allocation Plans (WAPs) and licences can specify certain levels of efficiency. Training, such as irrigation management courses provided through regional Natural Resources Management Boards, also helps to improve irrigation practices. The completion of WAPs across South Australia will continue to achieve efficiencies in water use.

The South Australian and Commonwealth Governments have initiated a range of strategies across the State to help the agricultural sector become more efficient. They include:

- An irrigator toolkit which includes an extensive collection of local information and tools from interstate and overseas to help irrigators use their water resources more effectively, and to nurse plants through the current dry conditions
- Assistance packages to dairy farmers on the Lower Murray swamps, between Mannum and Wellington, to enable some properties to be rehabilitated and others to be taken out of production. The aim is to improve irrigation efficiency by up to 64 GL; significantly improve the quality of drainage water; and facilitate reuse. Most properties have received funding approval and rehabilitation work is well under way. About 4000 hectares have already been rehabilitated. The project has facilitated significant restructuring of the local dairy industry through improved on-farm layouts, accurate metering, and the retirement of 20 per cent of the irrigated area from production
- Rehabilitation of pastoral bores in the Great Artesian Basin is improving the efficiency of water used for pastoral purposes. It is reducing water wastage and improving artesian pressure
- Financial assistance to upgrade the irrigation meters in the Central Irrigation Trust system in the Riverland to state-of-the art magnetic flow meters

In the rural sector generally there will be a shift towards highly efficient, best practice irrigation, using water for its highest value purposes. There is likely to be a gradual restructuring of the industry as a result. The availability of recycled water will provide additional sources of water for existing practices, and make possible the development of new enterprises. The value of water will gradually increase, forcing increased efficiencies and higher-value uses.

Primary production within the Greater Adelaide area currently uses approximately 36 GL/a of mains water. Already extensive use is made of recycled wastewater in the Virginia and McLaren Vale horticultural areas, and it has provided a reliable source of nutrient rich water for these important food bowl areas.

As stormwater and recycled wastewater become increasingly available to irrigators within the Greater Adelaide area, there will be an opportunity to reduce the amount of potable water used by these irrigators. It is estimated that the use of recycled water by this sector could reduce demand on potable water resources by up to 10 per cent.

As a further means of assisting irrigators to improve on-farm efficiency, water meters will be installed in the prescribed catchment areas in the Mount Lofty Ranges.

Action
Work with industry to encourage the uptake of stormwater and recycled water for primary production in lieu of mains water

Action
Irrigation meters will be installed in the Mount Lofty Ranges Prescribed Areas by 2014, once water users are licensed.

Rewarding effort and achievement

It is important to celebrate our achievements and good practices in water management. The Government will introduce statewide water awards to recognise the efforts of industry, business, communities, schools, local government and individuals who are making a contribution to securing our future water. Such awards could be promoted through the existing peak industry bodies.

Action
Develop an awards program, including a Premier's Award, to recognise the achievements of communities, individuals, schools, businesses, industry and government that are contributing to our future water security by the end of 2011.

In the preparation of **Water for Good**, a high-level theoretical study was conducted to identify those types of supply options likely to be the most economic and sustainable in meeting the growing water needs of Greater Adelaide to 2050.

Part 5

The future assessment of water projects – a new approach

Part 5
The future assessment of water projects – a new approach

Sustainability assessment approach

In the preparation of **Water for Good**, a high-level hypothetical study was conducted to identify those types of supply options likely to be the most economic and sustainable in meeting the growing water needs of Greater Adelaide to 2050.

This sustainability assessment complements traditional financial analyses by explicitly including the life-cycle costs and benefits of environmental and social externalities. While similar approaches have been applied for water investment decisions in other States, this is the first analysis in Australia based on a triple bottom line assessment at a strategic water policy level. This assessment will help South Australia lead the nation in shaping a more sustainable future in water planning.

The WorleyParsons EcoNomics™ Assessment was selected as the methodology for considering the financial, social and environmental implications of various hypothetical options. It provides a basis for quantifying, in present value monetary terms, the economic sustainability of a course of actions in a common unit, and allows their overall importance to decision-making to be seen in a clear and understandable way.

The methodology also allows comprehensive sensitivity analysis to examine the environmental, social and economic viability of each option, over a wide range of possible future conditions. A sustainability assessment ranks the options, in terms of overall security and susceptibility to changes in the values of key parameters, for which absolute future values are uncertain.

Guidance from government agencies and the latest peer-reviewed studies were used to select the range and base-case values for key parameters. The key parameters – and their base-case values – included:

- an explicit monetary value for water which represents its value to society, not the price that consumers pay. This includes a use value, option value and ecological services values – base-case value $5 per kL
- the value of marine ecosystems, impacted or protected
- energy-cost escalation – base-case value 2 per cent real per annum
- the value of greenhouse gas emissions to atmosphere – base-case value $23 per tonne, with 2 per cent real per annum escalation
- social discount rate – base-case value 4 per cent real per annum.

While the high-level study assessed supply options for Greater Adelaide, the costs and benefits were assessed in the context of the Australian economy as a whole.

Hypothetical supply options considered

Many options are available for adding to Greater Adelaide's water supply. Some pose an unacceptable risk to our health or the environment and others are simply not viable or practical at this stage. Several broad categories, however, warrant further exploration. They include desalination, purchasing Murray-Darling Basin water, increasing storages, various recycling alternatives, and demand management.

For the purposes of this high-level study, nine hypothetical strategic options were identified and their relative socio-economic net present value was evaluated.

Table 9

Hypothetical supply options to acquire up to an additional 50GL/a

Option	Description	Estimated average annual yield
Desalinated water		
Adelaide Desalination Plant	Double capacity of the Adelaide Desalination Plant from 50 GL/a to 100 GL/a and enhance interconnectivity of water supply network. Powered by sustainable energy sources.	50 GL
Murray-Darling Basin water		
Permanent water	Purchase 100 GL of permanent Murray-Darling Basin water to guarantee 50 GL in all years and enhance interconnectivity of water supply network. Assumes average 50 per cent water allocation across the water entitlement portfolio. Powered by sustainable energy sources.	50 GL
Temporary water	Purchase 50 GL of temporary Murray-Darling Basin water annually and enhance interconnectivity of water supply network. Assumes costs escalate at 3.5 per cent real per annum. Powered by sustainable energy sources.	50 GL
Recycled water		
Greenfield stormwater	Localised recycling of stormwater for non-potable use via aquifer storage and recovery (ASR) and a third-pipe network to homes and businesses in new developments.	4 GL
Greenfield wastewater recycling	Localised recycling of wastewater for non-potable use via aquifer storage and recovery (ASR) and a third-pipe network to homes and businesses in new greenfield developments.	4 GL
Brownfield stormwater	Harvesting of stormwater for non-potable use at multiple sites and recycling via ASR and a third-pipe network to supply existing homes and businesses (retro-fitting required).	50 GL
Large-scale stormwater	Three large-scale stormwater harvesting schemes with transfer of wetland and ASR treated water to a metropolitan reservoir for further treatment to potable standard. Includes enhanced interconnectivity of water supply network. Powered by sustainable energy sources.	20 GL
Additional storage		
Mount Lofty Ranges storage	Provision of substantial additional storage in the Mount Lofty Ranges with initial fill to be provided by temporary water purchases over 3 years. Includes enhanced interconnectivity of water supply network. Powered by sustainable energy sources.	200 GL
Demand management		
Enhanced demand management	New demand management initiatives that achieve 50 GL by 2050. Does not include water restrictions. Includes rebates, water saving devices and community education.	25 GL

These hypothetical options deliver varying maximum yields over different time periods. In comparing them, it is useful to use average annual yields over the 40-year period and to compare socio-economic net present values on a per-unit basis ($/GL).

The assessment is based on an average estimated demand in Greater Adelaide of 216 GL a year. This reflects expected demand if only permanent water conservation measures were enforced i.e. in the absence of water restrictions.

Supply options not considered

Over the years, many proposals for securing Greater Adelaide's water supplies have been put forward. Those commonly raised are listed below.

Although theoretically feasible, these options are uneconomic, still in development or have major social or environmental implications and have therefore not been considered in preparing this Plan.

A number involve transporting water over long distances, which is extremely expensive, both in terms of up-front capital costs and ongoing operating costs. The unit cost of water would be high when compared to the options selected for the assessment.

In other instances, the options are not in line with important policy positions aimed at protecting the quality of our water supplies and the drinking water quality provided to consumers. For example, augmenting public drinking water supplies with treated wastewater is not proposed.

The remaining suggestions are problematic, either because the amount of water they would yield cannot currently be verified, or because the technology to implement them does not yet exist, or has not been proven.

Technological advances and changing requirements will emerge and, as part of the adaptive management framework, will be assessed.

Sustainability assessment findings

The Worley Parsons modelling was applied to the nine options outlined in Table 9 to determine those that consistently delivered the better overall environmental, social and economic return for South Australia. The findings are reflective of the assumptions chosen for these options and the base-case values chosen for key parameters.

Figure 35, provides the results of the sustainability assessment in terms of net present value per GL. These values, which are used to compare the economic, environmental and social impacts of options, do not represent the net present value of the direct costs and benefits to a water supplier. Therefore, they do not necessarily reflect the price per kL that customers would pay for water.

Demand management

Demand management – specifically the suite of initiatives outlined in detail in Part 4 - *Using and saving water* – clearly proved to be the best method of achieving long-term water savings in Greater Adelaide. Demand management, particularly when combined with active public education efforts, consistently delivers the best overall environmental, social and economic return for society, under all future conditions tested. Individual initiatives within the suite vary widely on the basis of cost per kL saved, implying further business case analysis is needed to more accurately determine which individual demand management initiatives offer the best value.

It should be noted that some water savings will occur regardless of government intervention. For example, South Australians have and will continue to change their behaviour and water use practices simply because they believe it is important.

Demand management, through new water saving designs and practices, will achieve water savings gradually over the next 40 years so other supply options will be necessary to meet the gap between demand and supply in the shorter term.

Desalination

Expanding the Adelaide Desalination Plant emerged as the superior economic and sustainable option for meeting demand quickly in the short term. The modelling indicated that it is the preferred option after demand management and that its value rises as water scarcity increases.

Future opportunities for desalination will need to be considered on a case-by-case basis. New plants, rather than expansions of an existing plant, are likely to have higher capital costs and differing operational costs, although these could be offset by future technological advancements.

Table 10
Supply options not considered

Option	Description
Desalination plant	Sites other than Port Stanvac
Recycled water	Indirect potable reuse of wastewater or direct injection of stormwater into drinking mains
Reducing losses	Sealing all hills catchments
Diverting water	Pumping surface water or groundwater from the South East
	Pipeline from Ord River Scheme
	Diversion of Queensland rivers into the Murray-Darling Basin
	Diversion of water from north-east Queensland (Bradfield Scheme)
	Pumping groundwater from the Great Artesian Basin
	Back-loading water in shipping tankers
	Cloud seeding
	Harvesting icebergs

Federal funding contributions recently announced for the doubling of the Adelaide Desalination Plant have not been included in the sustainability assessment, but would improve the financial viability of this option. External funding for other options would also improve their financial viability.

Stormwater for drinking

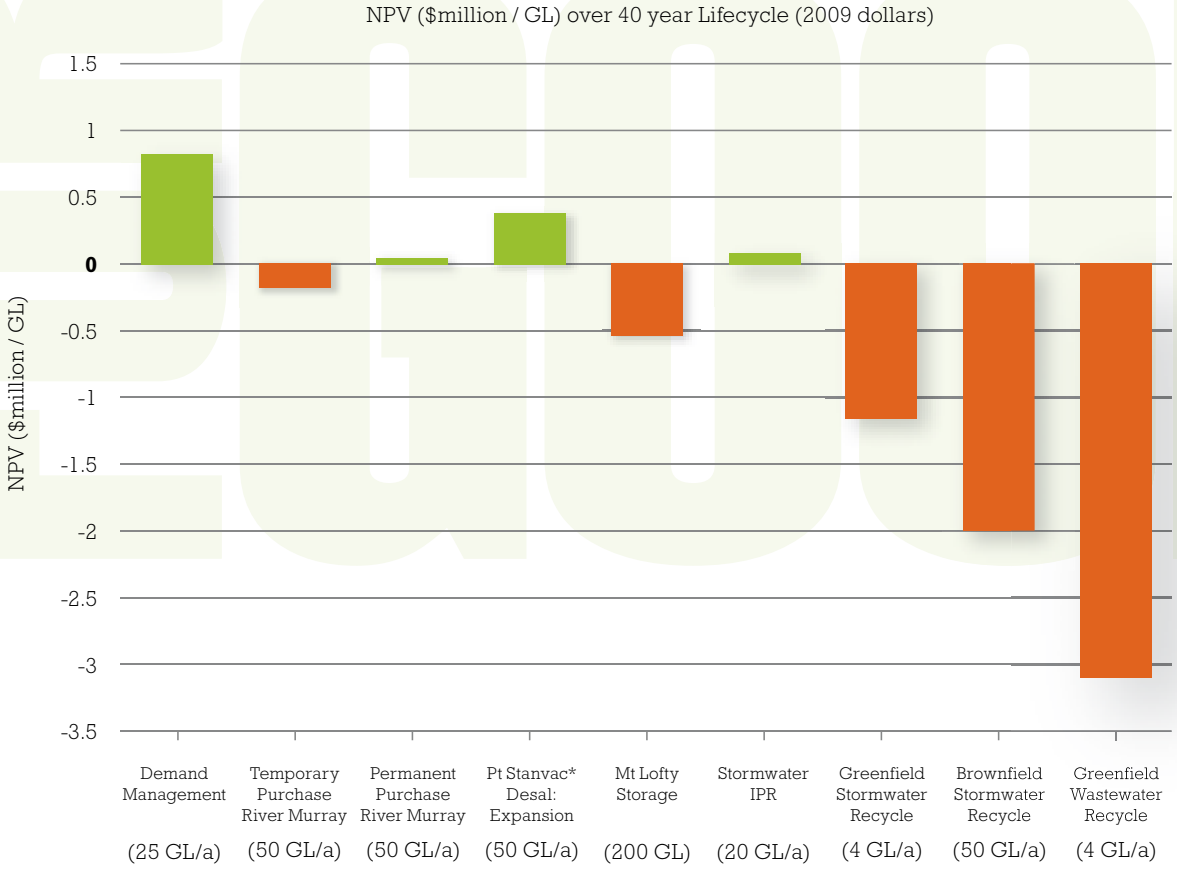
This Plan does not support the use of recycled stormwater for drinking purposes at this stage, but it will continue to monitor scientific developments in this area.

For the purposes of the study, 'Stormwater indirect potable reuse' (IPR) was examined. IPR is the process which involves capturing stormwater, pre-treating it, pumping it to reservoirs, treating it further and then injecting it into the mains system for drinking and other purposes.

The study found that this option cannot deliver the large volumes that desalination can. However, this option was found to have positive value and, like desalination, its value improved with increasing water scarcity. As costs used in the modelling for this option were not based on a fully-designed scheme (such as pipelines to the system) they are therefore indicative only.

While it is economically viable, the health risks involved with reusing urban road run-off stormwater for drinking require further investigation.

Figure 35
Supply Options



* Federal funding contributions recently announced for the doubling of the Adelaide Desalination Plant have not been included in the sustainability assessment, but would improve the financial viability of this option.

River Murray water purchases

The assessment of permanent water purchases from the Murray-Darling Basin was based on a 100 GL entitlement purchase from a range of water districts to achieve at least 50 GL of allocation in any given year. Under the base assumptions used in the assessment, permanent purchases offer marginal benefits to the community generally, but can also have significant social impacts on particular communities. Interestingly, the sensitivity analysis highlighted that the purchase of permanent water would rank higher where the total economic value of water was less than $3 per kL, or where the energy-cost escalation rate exceeded 8.5 per cent a year.

Permanent purchases are not a major feature of the **Water for Good** plan for Greater Adelaide in the long term because:

- allocations from the Murray-Darling Basin are uncertain
- there may be significant social impacts in some communities
- this option is inconsistent with the strategy to diversify supplies and reduce reliance on the river in a climate change environment.

Temporary purchases of Murray-Darling Basin water provide marginal social costs at the 50 GL scale. Purchases of this nature are best used to manage the variability of supply, rather than as a long-term supply augmentation strategy.

The total economic value of water, the energy-cost escalation rate, Murray-Darling Basin water allocations, and the need for environmental flows will need to be monitored to gauge any change in relative rankings of all the above options.

Stormwater, wastewater and reservoir storage

The assessment has shown that two of the options considered (greenfield wastewater recycling and brownfield stormwater recycling) are consistently uneconomic and unsustainable over a wide range of values for water, carbon, energy, and other key variables. The assessment was based on the average costs and benefits for a suite of projects, for which overall benefits to society were outweighed by costs.

All reuse options at greenfield sites were limited by their ability to create large volumes of water, and by the length of time it takes to build a sufficient customer base. Based on projections in the *Plan for Greater Adelaide*, and assuming that, on average, 100 kL of potable water per household could be substituted with recycled water, yield from greenfield reuse over the 40-year period would be limited to an estimated average 4 GL per annum.

Water for Good includes targets to 2050 for wastewater recycling and stormwater harvesting. Stormwater capture and reuse can offer substantial environmental and social benefits along with the added benefit of flood mitigation. Stormwater capture should be based on verifiable geological data, and because of the cost, will need to involve multiple funding partners. Some individual schemes are likely to offer substantial social benefits combined with strong community support.

As this sustainability assessment was based on a suite of projects, greenfield stormwater and wastewater recycling projects should continue to be assessed where conditions are favourable.

The option of expanding the storage in the Mount Lofty Ranges offers system flexibility but has significant social and environmental costs. Further analysis would almost certainly bring to light other social and environmental costs that were not possible to factor in to this high-level study. Options for increasing storage in the Mount Lofty Ranges require further detailed assessment but the implementation of the collection of actions in **Water for Good** should mean that this option will not need to be considered until 2050 at least.

Sensitivity Analysis

Sensitivity analysis was conducted across a range of values for the key parameters.

The sensitivity analysis identified that the overall conclusions of the assessment are robust over a wide range of values for the parameters examined. The parameters to which the options are most sensitive are the total economic value of water and the energy escalation rate.

As the total economic value of water increases, the sensitivity analysis reinforced the desalination plant as the preferred option after demand management. At low total economic values of water (i.e. below $3 per kL) permanent water purchases may be more beneficial to society than the desalination plant. However, the analysis does not quantify the benefits of diversity of supply.

In terms of energy security, desalination suffers most from annual real increases in the cost of power. This suggests that maximising the energy efficiency of the desalination plant will help to reduce this risk.

Other key parameters, particularly those around the basis of the climate predictions, were not analysed in this high level assessment. These parameters would most significantly affect permanent and temporary water purchases assumptions such as water allocations and the cost of water licences.

Notes about the study

The basis for this study was a suite of hypothetical options based on largely preliminary estimates. It also assumed that each parameter value was as probable as another, and this is unlikely to truly reflect likely outcomes. This approach was considered reasonable for a high-level study, particularly as a means of testing the sustainability assessment approach for future supply augmentation decisions. While this creates uncertainty regarding the absolute 'net present values' provided in the analysis, the relative economic performance of the options is considered robust.

Any decision to augment Greater Adelaide's water supply in the future should only be undertaken following detailed planning and design via independent planning functions and the adaptive management framework outlined in Part 3 – *The challenges of demand and supply*. Providing access to the state-owned network infrastructure through a state based third-party access regime may present the opportunity for new entrants to provide innovative supply options not considered by this high-level study.

Finally, this study has proved the value of the sustainability assessment approach to future supply option decisions. This model, or other comparable tools, will be considered for inclusion in the **Water for Good** adaptive management framework

Fresh legislation will be introduced to reflect a new approach to managing a more competitive and diverse water industry and an independent regulator will be appointed to oversee pricing, licensing and consumer protection.

Part 6

Fostering innovation and efficiency through planning, pricing, legislation and research

Part 6

Fostering innovation and efficiency through planning, pricing, legislation and research

Introduction

South Australia faces new and potentially extreme challenges to improve and maintain a secure water supply.

New institutional and legislative arrangements will build on previous reforms and provide a fresh approach to managing a more competitive and diverse water industry. Importantly, these arrangements will:

- ensure that planning for the future is driven by a better understanding of possible events
- provide for the independent regulation of water and wastewater services to ensure transparency and efficiency
- maintain SA Water in public ownership
- facilitate the setting of prices that more accurately reflect the precious nature of this essential resource, as well as the true cost of providing it
- support research to improve knowledge and drive innovation.

Overview of current arrangements

Water policy, management and planning

The various pieces of legislation which establish the institutional arrangements for managing SA's water supplies span 80 years – from the *Sewerage Act 1929* to the *Local Government (Stormwater Management) Amendment Act 2007*. Much of this legislation needs to be modernised. (A complete list of legislation pertaining to water appears in Appendix 2).

Legislation covering water policy, and the management and planning of South Australia's water resources, has undergone considerable adjustment in recent years, with the implementation of an integrated approach to resource management through the *Natural Resources Management Act 2004*. This Act is built on the premise that natural resources do not occur in isolation of each other: water and land form the basis of every ecosystem; and the health of ecosystems is strongly linked to the management of these fundamental natural resources.

Additional legislative and institutional reforms are designed to build further on this approach, ensuring a holistic foundation for water security policy and planning.

Under current arrangements, each of the agencies involved has both a mandate and the requisite expertise for a particular aspect of the water cycle. While in many instances the roles and responsibilities are clear, there are some overlaps and gaps in delivery. The proposed new arrangements seek to rectify this by ensuring integration – facilitating seamless interface so that the valuable expertise we have is well used and properly allocated.

Service delivery

SA Water and its predecessors have been delivering water and wastewater services to the State for 150 years. The legislation underpinning the operation of SA Water *(Sewerage Act 1929 and Waterworks Act 1932)* was developed at a time when only one type of water and one water supplier were envisaged. These arrangements have served the South Australian community well, providing a high level of service for the driest State in the driest inhabited continent. However, new challenges require new approaches.

Competitive tendering under the National Competition Policy has brought about changes in the way we deliver water services in South Australia. Although SA Water is a corporate entity fully owned by the South Australian Government, it now manages several service and maintenance contracts. The largest is a 15-year contract with United Water to manage the operations and maintenance of metropolitan Adelaide water and wastewater systems, including the delivery of capital works for rehabilitation and augmentation.

Ownership of water and wastewater infrastructure remains with SA Water. The corporation is also responsible for the collection of all revenue from customers, in accordance with the rates determined by the Government.

The key objectives of the United Water contract are:

- to achieve significant cost reduction through the introduction of improved efficiency and quality in the provision of services to customers
- develop a viable, export-focused, vigorous water industry in South Australia.

The other public-private contracts managed by SA Water are with:

- Riverland Water, which operates 10 water filtration plants in regional South Australia
- United Utilities Victor Harbor, which operates the Victor Harbor Wastewater Treatment Plant
- United Group, which operates nine plants for SA Water in communities along the River Murray.

Stormwater management and reuse is a new and important water resource. A shift in the concept of stormwater from a drainage task to an alternative fit-for-purpose supply option illustrates the changing water market.

Customer feedback and performance monitoring

Agencies engaged in providing water security are currently required, at a minimum, to report regularly on their performance. For instance, SA Water reports annually through the National Performance Report compiled by the National Water Commission and Water Services Association of Australia (WSAA). SA Water also reports voluntarily on its sustainability performance and publishes an annual drinking water quality report.

A commitment to customer standards and continuous improvement has seen agencies introduce additional stakeholder feedback mechanisms (e.g. SA Water's Customer Council). Further improvements to transparency, customer involvement and accountability will be included in the legislative reform package.

Future arrangements

The planning and implementation of water security, public health and environmental programs will require cooperation both between various government agencies and between governments and other stakeholders. While this is occurring successfully with the Adelaide Desalination Project and Water Proofing Adelaide projects, at times gaps occur through lack of clarity of roles and responsibilities.

It is now timely to review the enabling legislation to address any ambiguity and provide greater certainty and clearer direction for water security, sustainability and public health.

South Australia's water supply and wastewater services legislation will be extensively reformed to deliver a definitive framework for water management and regulation, and complement the integrated approach applied to natural resource management.

The reforms will:

- recognise the developing water supply and wastewater service industry
- provide a single legislative focus for the supply of water
- provide for the comprehensive management of water supply to ensure efficiency and public safety in the environmentally sustainable framework provided by the *Natural Resources Management Act 2004* and the *Environment Protection Act 1993.*

In addition, the Local Government Association of South Australia, through its recent report, *Local Government's Current and Potential Role in Water Management and Conservation,* has highlighted the need to strengthen the effectiveness of stormwater management. Amendments to the *Local Government (Stormwater Management) Amendment Act 2007* will be developed in conjunction with Local Government.

Proposed institutional arrangements

Proposed institutional arrangements are represented in Figure 36 below. The changes stem from the planning and industry regulation reforms outlined in the legislative and regulatory reform section of this chapter, and flow through to service delivery and performance assessment.

Water policy and planning

- responsibility for strategic water security planning will rest with the Minister responsible for water security, who will be required to establish an independent planning body if agreed demand-supply triggers are reached
- the Minister will lead consideration of stormwater harvesting and reuse as a potential component of water security planning
- the independent economic regulator, ESCOSA, will review a licensee's forward capital plan.

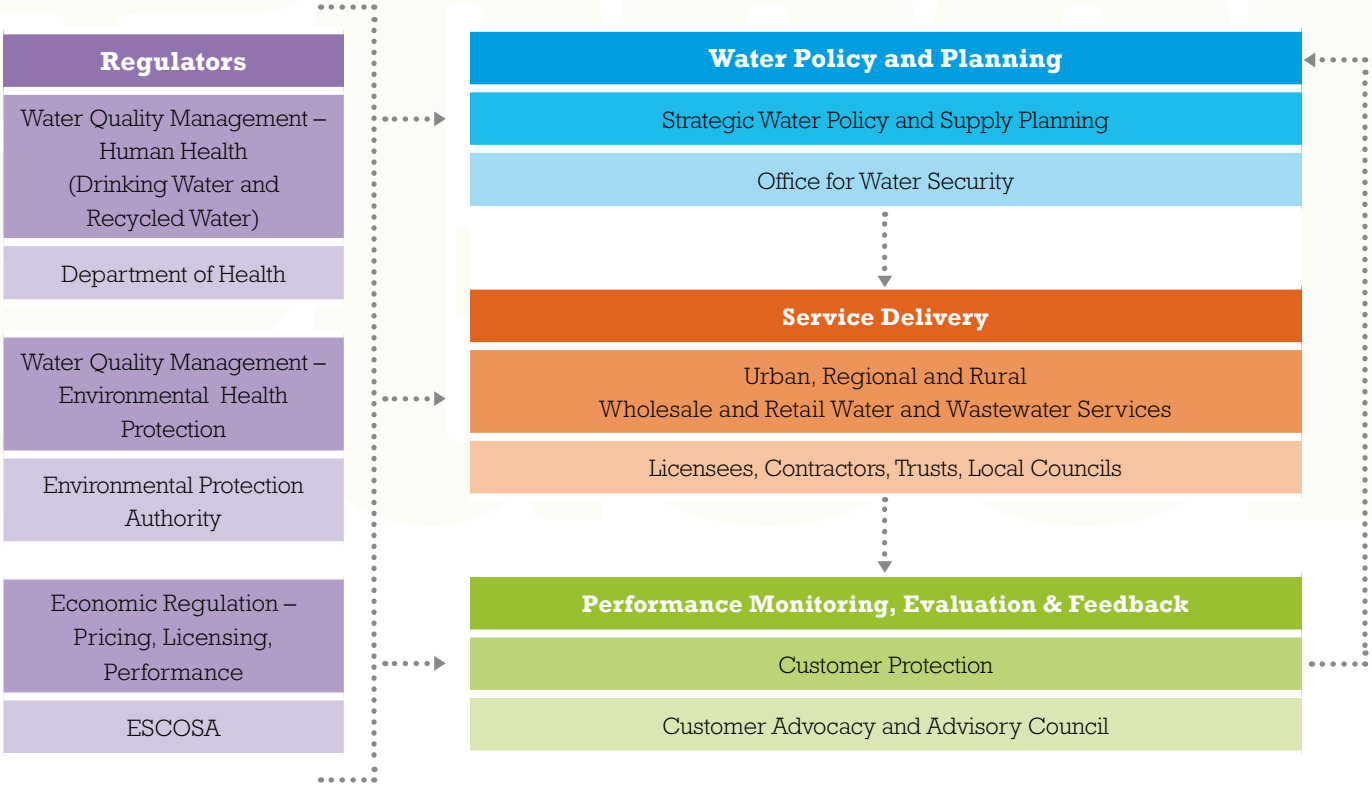
Service delivery

- all service providers, including SA Water, will require a licence to operate. (Currently no providers require such a licence)
- pricing will be set by an independent economic regulator (ESCOSA)
- strict conditions will be set for new service providers (licensees) seeking to enter any segment of the water market.

Performance monitoring, evaluation and feedback

- the performance standards of all licensed operators will be monitored and reported on publicly by the independent economic regulator.

Figure 36
Proposed institutional arrangements



Planning

South Australia's geography and range of climatic conditions mean the availability and reliability of water varies across the State.

The Greater Adelaide region, in particular, has expanded steadily during the past decade and, with initiatives such as the 30-year Plan for Greater Adelaide in place, it will continue to grow in a managed and integrated way. However, our ability to sustain growth and achieve prosperity relies on a secure, healthy and reliable water supply.

State Government agencies, including the Natural Resources Management Boards, undertake planning and regular monitoring and assessment of the state and condition of our water resources, and the likely demands on them. These water planning, monitoring and assessment arrangements have worked and continue to work well. However, more effort and co-ordination is needed for improved management in new, and potentially harsher, conditions.

We must improve our understanding and management of the resources we rely on now, and those we will need in the future. Our land use planning system – not just for Greater Adelaide but also for regional centres – must be 'water-sensitive'.

Key points

- water availability and reliability varies substantially across South Australia
- recent reforms have led to significant progress in water management planning
- we now face climate variability and changing climatic conditions that put new pressures on water use and threaten supply. Further reform is necessary to build on the successes to date
- planning for future supply with a high level of uncertainty is complex and requires a flexible approach
- water planning must consider the quantity and quality of all current and potential water resources in each region
- water demand and supply planning will be tailored to meet the needs of each region. It will build on and not duplicate existing plans for each region.

Actions and outcomes

Outcome

Adaptable, efficient and enduring water supply and management options are delivered within an environmentally sustainable framework that is supporting economic prosperity, population growth, and an enhanced quality of life for all South Australians.

New actions

Ensure regional water demand and supply plans are in place for all natural resources management regions throughout the State – in consultation with regional communities, building on existing plans, and incorporating local knowledge by 2014

Commission or contribute towards the development of a regional demand and supply forecasting model

Develop and implement a strategy to improve the quality of water provided to remote communities.

Outcome

Mandatory water-sensitive urban design for new residential and commercial urban developments dovetails with the Plan for Greater Adelaide.

New actions

By 2013, develop and implement the best regulatory approach for South Australia to mandate water-sensitive urban design, dovetailing with the Plan for Greater Adelaide

Introduce targets for water-sensitive urban design by 2010.

Current water management planning

South Australia's water management legislation – the *Natural Resources Management Act 2004* and the Environment Protection (Water Quality) Policy under the *Environment Protection Act 1993* – has provided a progressive framework for South Australia to manage its water resources.

South Australians can be proud of the way water is being managed but changing circumstances and the changing climate mean we must be flexible and continue to reform when the need arises.

The current approaches to water management in South Australia include:

- natural resource management planning, incorporating water allocation planning
- SA Water's long-term planning
- environment Protection Policy (Water Quality) and associated codes of practice and guidelines.

These planning approaches are described below. Together they will provide a strong foundation and significant input for future water demand and supply plans.

Natural resources management planning

The *Natural Resources Management (NRM) Act 2004* requires the development and maintenance of an NRM plan for the State and each of its eight NRM regions. The State Plan identifies a 50-year vision for natural resources management in South Australia and sets out policies, milestones and strategies to achieve that vision. Each regional plan, which must be consistent with its State counterpart, focuses on the use and management of the region's natural resources. It covers the protection and management of land, water and biodiversity resources; the control of pest plants and animals; support for sustainable industries; and the promotion of education and capacity building.

Among other things, a regional NRM plan contains considerable information about the water resources of the region, including:

- methods for improving the quality or value of resources, and the health of aspects of the environment that depend on those resources
- methods for the conservation, use or management of water
- action plans for stormwater management and flood mitigation
- arrangements to ensure the appropriate management of wetlands, estuaries and marine resources, with particular reference to the relationships between catchment, wetland, estuarine and marine systems.

The regional NRM boards are at varying stages of developing their comprehensive plans. At the time of writing, four had been completed and others were close to completion.

Water allocation planning

Under the *Natural Resources Management Act 2004*, NRM Boards develop water allocation plans (WAPs) for each prescribed water resource within their region.

A prescribed water resource may be surface water, groundwater, a watercourse, or a combination of these. Across South Australia there are currently 27 prescribed water resources. WAPs have been, or are being, developed for 23 of these, with the remaining four covered by a special regulation.

A WAP is a legal document detailing the rules for the allocation, use and transfer of water from prescribed water resources, as well as the water-affecting activities that require permits. Under the *Natural Resources Management Act 2004*, both human demands and the needs of the natural environment must be considered when determining appropriate limits on the amount of water that can be diverted from the water resource for all uses.

South Australia, along with other states, is in the process of making changes to water licensing arrangements as part of its commitment to the National Water Initiative. In summary, the existing water licences will be separated or 'unbundled' into their main components. These components are a Water Access Entitlement, a Water Allocation, a Site Use Approval, a Water Resource Works Approval and a Delivery Capacity Entitlement.

Changes to water licensing arrangements aim to benefit water users by making transfers easier and more efficient, expanding the choices available for water management, and clarifying water rights. The purpose is to create greater certainty for investors, and increase the efficiency of water markets and water use.

South Australia's approach to water allocation planning is consistent with the National Water Initiative in that it requires the development of water plans for the surface water and groundwater management units in which entitlements are issued. The aim is to help governments and the community make sound water management and allocation decisions to meet economic, environmental and social objectives.

Environment Protection (Water Quality) Policy 2003 and associated codes of practice and guidelines

The Environment Protection Authority (EPA) has the power to regulate and prosecute with respect to water pollution.

The main objective of the Water Quality Policy is to 'achieve the sustainable management of waters, by protecting or enhancing water quality while allowing economic and social development'. The policy aims to achieve this objective by:

- setting environmental values and water quality objectives for streams, rivers, oceans and groundwater
- establishing obligations for industry and the community to manage and control different forms of pollution
- encouraging better use of wastewater
- using codes of practice that describe best practice environmental management for particular activities, and which can be enforced using environment protection orders
- promoting environmental responsibility and community involvement in environmental issues
- setting discharge limits for particular activities.

SA Water long-term planning

SA Water's long-term plans aim to ensure that its bulk systems, including water sources, treatment plants and transfer pipelines, have sufficient capacity over a 25-year period. To achieve this, the plans consider:

- analysis of the current status of water resources and bulk systems
- estimates of population growth
- analysis of development, by sector growth
- allowances for environmental and sustainability issues, including climate variability and change.

The *Eyre Peninsula Long Term Plan* was developed in close consultation with the regional community and released in November 2008.

Anticipated growth in agriculture, mining and aquaculture, along with the uncertainty of climate change, were key elements considered. The plan recommends a range of strategies, including identification of additional water sources, water quality initiatives, groundwater basin monitoring and modelling, water conservation, small town supply, and recycled water.

The plan's demand assumptions and recommendations will be monitored and reviewed annually.

SA Water is now developing similar plans for Yorke Peninsula and Kangaroo Island.

Future water management planning – total water-cycle management

Throughout the past century, we have managed our water cycle using large-scale, centralised systems in which different types of water – water supply, run-off (including stormwater) and wastewater – are managed separately with a 'single-use' approach. These methods have improved the community's quality of life – particularly through the reliable provision of clean water and the reduction in the risk of infectious diseases.

In the future, to ensure the success of **Water for Good** and all the benefits that the community expects, water will need to be managed in a more integrated way – through what we call total water-cycle management. This recognises that water supply, stormwater and wastewater services are interrelated components of catchment systems and, therefore, must be dealt with using a holistic water management approach that is ecologically sustainable.

Water-sensitive urban design

Water-sensitive urban design (WSUD) is an approach to urban planning and design that integrates the management of the total water cycle into the land use planning and development process. With South Australia's population expected to reach two million by 2027, we can expect high growth in greenfield developments. This presents an ideal opportunity to incorporate WSUD into all aspects of land use planning and development to improve water use efficiency in Greater Adelaide and regional centres – creating water-sensitive cities and towns across South Australia.

The key elements of water-sensitive urban design include:

- integrating the management of groundwater, surface run-off (including stormwater), drinking water and wastewater to protect water-related environmental, recreational and cultural values
- increasing the storage, treatment and beneficial use of run-off – at building and street level, and including stormwater
- increasing the treatment and reuse of wastewater
- using vegetation for treatment purposes, water-efficient landscaping and enhancing biodiversity
- using water saving measures inside and outside domestic, commercial, industrial and institutional premises, to improve water efficiency.

Water-sensitive urban design can provide significant reductions in water use without adversely affecting our lifestyles. For instance, an average household in Greater Adelaide that is not currently using any efficient devices or water saving measures can use up to 280 kL a year. In comparison, a similar dwelling that uses the principles of WSUD can reduce its annual water usage by up to 110 kL/a.

Water-sensitive urban design measures

WSUD measures can be applied on a broad range of scales, from large public open space areas to individual blocks. A range of measures can be used, depending on the nature of the development and local conditions.

Those best suited to our region include (but are not limited to):

- demand reduction
- rainwater tanks
- rain gardens
- green roofs
- infiltration systems
- permeable pavements
- urban water harvesting and reuse
- gross pollutant traps
- bio-retention swales and basins
- swales
- buffer strips
- sedimentation basins
- constructed wetlands
- wastewater management

Greater Adelaide WSUD framework and technical manuals

In January 2007, a project, led by the Department of Planning and Local Government, was established to institutionalise water-sensitive urban design in the Greater Adelaide region. The project received substantial funding from the Commonwealth Government and additional funding from various State agencies and the Local Government Association (SA). The project's purpose was to investigate formalising WSUD principles and ensure best practice in all forms of urban development and associated activities.

The project has produced reference tools tailored to suit local conditions (e.g. soil and hydrology) for consistent application by State and local government, planning practitioners and the development industry.

WSUD in other states and territories

Other states and territories use a number of approaches to encourage and mandate water-sensitive urban design.

New South Wales has introduced a building sustainability index (known as BASIX), which is mandatory for water and energy, and incorporates the target of a 40 per cent reduction in the use of potable mains water. This initiative has reportedly achieved a 45 per cent reduction in 'BASIX houses' compared with houses built prior to the introduction of this system.

The Australian Capital Territory also has mandatory targets seeking a 40 per cent reduction in mains water consumption for new developments and redevelopments. Both the ACT and Victoria have mandatory provisions relating to the management and use of stormwater in new developments.

Western Australia and Queensland also have a mix of policy incentives, such as water quality targets, strategies and planning principles that encourage water-sensitive urban design.

The South Australian Government will determine the best approach for implementing WSUD in this State, taking account of a range of factors including housing affordability.

Action

By 2013, develop and implement the best regulatory approach for South Australia to mandate water-sensitive urban design dovetailing with the Plan for Greater Adelaide.

Action

Introduce targets for water-sensitive urban design by 2010.

Regional water demand and supply planning

Detailed, integrated regional water demand and supply plans will be developed to secure adaptable, efficient and enduring water supply and management options – delivered within an environmentally sustainable framework – to support economic prosperity, population growth, and an enhanced quality of life for all South Australians.

These regional plans will build on other water planning processes, and consider all water resources within a region. They will inform the adaptable planning framework outlined in *Part 3 – The challenges of demand and supply*.

The process for developing these plans will be flexible so that it can be tailored to meet the needs of different regions.

Community engagement – drawing on the skills and knowledge of regional communities – will be of paramount importance.

Regional water demand and supply plans will need to include:

- analysis of the current status of water resources and bulk systems
- estimates of population growth
- analysis of development, by sector growth
- allowances for environmental and sustainability issues, including climate variability and change
- actions, including infrastructure and demand management options, for addressing any forecast gaps in the supply-demand balance.

Status of available resources

Before we can look forward and consider how to address a region's water future, we must first understand the foundations that support it. Regional demand and supply plans will report the status of all current – and potential – resources and consider both quantity and quality issues.

The resources considered will include, but not be limited to, surface water, groundwater, watercourse water, stormwater, recycled wastewater, rainwater and desalinated water. How these resources are used in the supply system will also be taken into account.

Demand and supply forecasts

Demand and supply forecasts will be undertaken, where required, to determine whether a region's current water sources are sufficient to continue to meet demand, or whether augmentation is required and feasible.

The forecasts will be based on a range of assumptions (for each of the triggers discussed in *Part 3 – The challenges of demand and supply*). Each of these will be outlined to ensure transparency and engender confidence in the decision-making process.

Action plan

Once forecasts have been established, an action plan will outline how to close any identified gap between demand and supply. The actions in any one plan are

likely to be diverse and include demand management and augmentation options. It is expected that a range of stakeholders will be responsible for the implementation of the various actions and strategies.

As much as possible, the action plans will aim to complement, build on and, in some cases, inform existing plans.

Action
Ensure regional water demand and supply plans are in place for all natural resources management regions throughout the State – in consultation with regional communities, building on existing plans, and incorporating local knowledge by 2014.

Links to other plans

Logically, there will be links between the regional water demand and supply plans and other plans, so the relationship between them must be clearly defined.

Clear links will exist with regional NRM Plans (including water allocation plans), water quality improvement plans, and land use planning and development. The range of relevant State and national strategic plans and reform programs includes:

- *South Australia's Strategic Plan*
- **Water for Good**
- the State NRM Plan
- the *National Water Initiative*
- various development plans.

Water allocation planning

A regional water demand and supply plan will propose and manage actions to achieve a sufficient supply of appropriate quality water to meet the demands of an entire NRM region. Water allocation plans (WAPs) – where they exist – will be the primary documents for determining how much water is available and how it is used in each prescribed area.

Any change in the availability of water in prescribed areas would require the review and potential amendment of the relevant regional demand and supply plan.

New legislation will ensure that the relationship between WAPs and regional plans is well defined.

Water quality improvement plans

The Environment Protection Authority (EPA) is working to develop agreed environmental values for important bodies of water. To achieve this, it is developing water quality improvement plans for key areas across the State.

'Environmental values' describe the uses for which a local community agrees a body of water should be protected (e.g. aquatic ecosystems, stock watering, drinking water supply, or recreation). However, regional water demand and supply planning is likely to highlight water resources that need to be maintained for drinking water. The assignment of environmental values will therefore need to be consistent with regional water demand and supply plans.

Land use planning and development

The regional water demand and supply plans will provide forecasts that outline when augmentation of supply may be required. To ensure these forecasts are accurate, the plans will need to consider the implications of future land use planning and development strategies. It follows that, to ensure that future water demand is sustainable and achievable, land use planning strategies will have to take into account available supplies.

In June 2007, the State Government announced a review of the South Australian land use planning and development system. It recommended that a 30-year Plan for Greater Adelaide be developed by June 2009, and a further five regional plans be developed by June 2010.

These plans are under way and include targets for population and growth precincts, as well as strategies to address water efficiency. These features clearly have the potential to influence regional water security, so consistency between **Water for Good** and the Plan for Greater Adelaide will be essential. To ensure this is the case, the Office for Water Security and various other agencies have contributed to the development of the Plan for Greater Adelaide. Similar collaboration will occur during the development of future related plans.

Process for developing regional water demand and supply plans

The development of water demand and supply plans for all of South Australia's eight NRM regions will be a statutory requirement under the new legislation proposed in **Water for Good**. The development process should be flexible so that it can be tailored to meet the different needs of each region.

The Office for Water Security (OWS) will lead the development of the plans, with support from a steering committee. That committee would include representatives from key organisations appropriate to the region, such as:

- Department of Water, Land and Biodiversity Conservation (DWLBC)
- SA Water
- the Environmental Protection Authority
- the relevant NRM board and
- Local Government.

Community engagement will be integral to the success of these plans. The mechanism used to engage with the community may vary from region to region, based on local circumstances and needs, and take account of water planning and consultation that has occurred previously. It will therefore be up to each region to develop its own community engagement strategy.

Engagement strategies will need to ensure that key stakeholders are aware of, and involved in, the development of their regional plan. They may provide local knowledge, raise concerns and ideas, and provide advice and help engage and communicate with local communities. For example, local government involvement will be essential because councils manage stormwater infrastructure and community wastewater management schemes.

Baseline data, monitoring and assessment

The Government, through its various agencies, maintains an extensive water monitoring and assessment program focusing on key water resources throughout the State. Water allocation plans also, in most cases, establish a regime that monitors the resource at a regional scale (e.g. using a network of observation wells to monitor water levels). In addition, they require licensees to report annual water use.

Current monitoring does not, however, cover all water resources in all areas. Further effort is needed to help with decision-making and the annual reporting of the demand and supply balance in all areas. These actions will assist evaluation of standards and current resource conditions, and provide early feedback on progress to reduce demand and increase supply.

Comprehensive and accurate baseline data, thorough monitoring, and regular assessment are all crucial to the development, annual review and amendment of this Plan and supporting regional plans.

In some regions, before water demand and supply plans can be developed, further monitoring and assessment will be required to present an adequate status of current resources. This is because the total capacity, current extractions and sustainable yield of some resources are not yet fully understood. Further study of the impacts of climate change at a regional scale also will be necessary before adequate forecasts can be prepared and suitable strategies developed.

The network of monitoring sites across the State's water resources needs to be expanded and data assessed more regularly. This is discussed further in *Part 4 – Rain, rivers, reservoirs and aquifers*. More monitoring sites will result in improved information, which will help with the processes of annual review, comprehensive review, and amendment.

The development of a model to generate regional demand and supply forecasts will also be required. Data collated from ongoing monitoring will be entered into the model.

Further information about our plans to improve monitoring, assessment and modelling capability can be found in *Part 3 – Managing our water future*.

Action

Commission or contribute towards the development of a regional demand and supply forecasting model.

Water in remote communities

Provision of good quality water to remote communities is becoming particularly challenging as local resources decline. 'Remote' communities need to be distinguished from 'rural' communities. 'Remote' refers to communities that are geographically isolated and vulnerable as a result of their extreme isolation.

Indigenous community supplies

Under South Australia's bilateral agreement with the Commonwealth on essential services infrastructure, the Aboriginal Affairs and Reconciliation Division (AARD) of the Department of the Premier and Cabinet is responsible for providing water to the 18 major Aboriginal communities in South Australia. SA Water, under contract to AARD, has played a significant role in delivering reliable, high quality water services to these communities. Water is provided via bores, household rainwater tanks, water harvesting sheds, reverse osmosis and river supplies –either directly serviced by AARD or contracted out to other service providers, including SA Water and the Department of Water, Land and Biodiversity Conservation.

The State Government recognises the unique relationship that Aboriginal people have with water and is meeting its international obligations to consult with Indigenous communities on water matters that affect them.

Non-potable SA Water supplies

Within the supply systems operated by SA Water, there are 19 non-potable supplies and a further eight non-potable zones. Poor microbiological content, elevated chemical content, or both, render them below drinking water standards, and the treatment required to remedy these problems is very expensive. These supplies, serving approximately 2000 people, are predominantly in the Far North and include Marla and Oodnadatta. Others, such as former railway towns in the State's north-east, rely on carted water when local dams cannot be used for reasons of quality or quantity.

Independent non-potable supplies

A small per centage of South Australia's population not currently supplied by SA Water can be categorised as independent Council (or Progress Association) schemes, and individual schemes which rely mainly on rainwater tanks or groundwater. In many of these areas there is considerable community demand for improved water supply services and this has been heightened by the decline of existing supplies. There have been cases in the past, however, where communities have voted against an offer of a potable supply, mainly because of concerns about increased water rates.

Addressing remote community supplies

More can be done to supply water of good quality to remote areas. This will require careful assessment of a range of issues, including:

- opportunities for using recycled water
- availability of culturally relevant information to remote communities, for example about water supply limitations and opportunities
- the financial cost and funding for remote supplies.

Action

Develop and implement a strategy to improve the quality of water provided to remote communities.

Research and innovation

By virtue of our dry climate and varying – often harsh – terrain, South Australia has a long history of innovation in the use, conservation and management of water.

For many decades, research has supported and fostered ingenuity and the work of South Australian research bodies is recognised interstate and overseas.

Quality research and innovation will accelerate the development of new and exciting water-sensitive cities and regions. Development of a science strategy for water – guided by policy imperatives and using strong collaborative research partnerships – will be part of an overall response to challenges including climate change, social and economic factors, and energy.

We are committed to the development and promotion of water research and innovation that will benefit South Australia and help communities, the environment and governments deal with water-related issues nationally and internationally.

Key points

- knowledge is critical for a successful, adaptive, integrated approach to water management
- a number of key research organisations contribute to South Australia's water security
- a strong culture of collaboration and cohesion enhances research and innovation outcomes
- identification of the research priorities for South Australia will ensure the best use of available research capability.

Actions and outcomes

Outcome

South Australia's research and innovation capability contributes to our efforts to secure an adaptable, efficient and enduring water supply delivered in an environmentally sustainable framework.

Action under way

Work with research institutions and industry to enhance co-ordination of the research effort and improve collaboration to identify priorities and ensure timely delivery.

Discussion

It is generally accepted that sound knowledge underpins successful water security. A huge amount of water-related research activity is currently under way. Substantially better outcomes could be achieved with greater collaboration between government, research institutes and industry. This would compound the value of existing knowledge, identify gaps and help the State meet its obligations under the National Water Initiative. This includes enhanced understanding of the social, environmental and economic values that contribute to community, industry and government decisions about water.

South Australia is in the fortunate position of having its research institutes, including three universities, in relatively close physical proximity. A number of collaborative relationships have been established between these organisations and government, and the Natural Resources Management Research Alliance is a very good example.

Collaborations such as this can be used to efficiently leverage research investments.

South Australia is also home to a wide range of industry research facilities and a number of important public research organisations – including arms of the CSIRO, and the research headquarters of the Defence Science and Technology Organisation, which boasts the largest number of research scientists in a single location in Australia, as shown in Table 11.

If we are to achieve all the goals within **Water for Good**, and secure the State's long-term water future, we must foster an active culture of innovation. Knowledge must be captured and used to drive innovation across the whole of our economy, and government.

South Australia is well positioned to lead the nation in water-sensitive urban design, stormwater use, and advanced modelling strategies for water resource management. We must ensure that we are well placed to encourage innovative investment opportunities and 'best practice' by industry, not only at the State level, but nationally and globally as well. Ongoing development will be needed in areas such as wastewater recycling and desalination. Creating strong links between government and private industry through organisations such as the Natural Resources Management Research Alliance and the SA Centre for Innovation ensures that industry views and concerns are addressed and that we extract the greatest value from research and investment opportunities – in new and existing markets.

> Tomorrow's competitive edge in exports and the sustainability of our natural resources depends on today's investment.

Currently, nationally and globally, there is a recognised shortage of qualified water research professionals and we must address this. We will ensure that South Australia continues to cultivate and reward skilled people and ensure the availability of well-trained professionals to work in water-related areas. We need to retain the best people and attract new qualified players and quality ventures.

Investment in innovation and research is fundamental to securing and sustainably managing South Australia's water into the future. All levels of government, industry, research institutions and Natural Resources Management Boards need to work together to create an environment where knowledge is shared and capitalised on for the benefit of all.

Table 11
Current research institutions and collaborative projects

Collaborative research institutions

University of Adelaide	University of South Australia	Flinders University	CSIRO	Other
ICEWaRM - Living Laboratories	Centre for Comparative Water Policies and Law	Flinders Research Centre for Coastal and Catchment Environments (FR3cE)	Water for a Healthy Country	Australian Water Quality Centre
Water Research Cluster Environment Institute	SA Water Research Centre for Management and Reuse	National Centre for Groundwater Research and Training		Cooperative Research Centres eg. – eWater – Irrigation Futures – Catchment Hydrology

Major users and funding bodies of water research and innovation

Commonwealth Government	State Government	Local Government	Water Industry
National Water Commission - National Water Initiative	DFEEST – Premier's Science & Research Council	Individual councils	Water Industry Alliance (240 companies, including United Water)
Bureau of Meteorology - Improving Water Information Program	PIRSA – SA Research & Development Institute	Local Government Association	
	DTED – Centre for Innovation		
	SA Water – Research & Development Committee		
	DWLBC & NRM Boards		
	DPC – Office of Sustainability & Climate Change		

Key innovation and research organisations

The following innovation and research organisations are contributing to securing South Australia's water future:

Premier's Science and Research Council

The Premier's Science and Research Council was established in June 2002 by the Premier, the Hon Mike Rann MP, to advise Government on the development of policies and strategies for the further development of innovation, science research and technology in South Australia. The Council comprises senior representatives from the State's three major universities, local and Commonwealth research institutes, industry, and State Government ministers. It is jointly chaired by the Premier and the Chief Scientist, Dr Ian Chessel.

The council is specifically responsible for identifying research and development priorities for the State. A key activity is the implementation of a 10-year Vision for Science Technology and Innovation in South Australia – STI10. This was developed in consultation with educational and research institutions, business and industry groups, government agencies, and regional and community groups. It aims to generate great ideas, value knowledge and ground the State in innovative practice. It is underpinned by three strategies: building capacity and infrastructure; momentum through collaboration; and developing people and communities. Since the launch of STI10 in 2004, the Department for Further Education, Employment, Science and Technology (DFEEST) has developed a new framework called 'Constellation SA' to strengthen collaboration between researchers, within and across disciplines, and improve the interface between the research community and end-users so that research findings are taken up and used for practical purposes. Constellation SA is now the overarching program for the implementation of STI10.

Natural Resources Management (NRM) Research Alliance

The NRM Research Alliance was recently launched as one of seven within the Constellation SA frameworks, under DFEEST, to ensure both a collaborative approach to research and help facilitate the translation of research into practical solutions. Alliance members are: the eight regional NRM Boards, the State NRM Council, CSIRO, University of South Australia, University of Adelaide, Flinders University, PIRSA, Department of Environment and Heritage and Department of Water, Land and Biodiversity Conservation. There is an independent chair.

The aims of the Alliance are to:

- strengthen collaboration between researchers, within and across disciplines
- improve the interface between the research community and the practitioners to help translate research into practical solutions
- advocate the uptake of NRM research outcomes into relevant on-ground management practices, and policy and planning processes
- attract and direct investment into NRM science, technology and innovation that will lead to improved NRM outcomes.

A focus area for collaboration and capacity building is the social and economic aspects of natural resource management, including those relating to water management and allocation.

University City

Our three State universities are dedicated to excellence in teaching, learning and research. Each university has an entity dedicated to developing and commercialising intellectual property arising from its research. These include: Flinders Technology Pty Ltd (Flinders University); Adelaide Research and Innovation (University of Adelaide); and ITEK Pty Ltd (University of South Australia). Quality graduates further facilitate research development. Each university's contribution to water research is substantial and growing to encompass collaborative research projects and links with other universities and industries around the world.

There is clear expertise developing within each university. University of South Australia, for example, is working on comparative water policies and water quality; University of Adelaide is focusing on water management; Flinders University is hosting the National Centre for Groundwater Research and Training, as well as the Centre for Coastal Waters and Catchments.

In addition, the University of Adelaide launched the new Environment Institute on 4 June 2009. Under the directorship of Professor Mike Young, it comprises a dedicated team of leading environmental scientists from South Australia and Australia working together to solve our most difficult environmental problems. It includes a Water Research Centre which brings together a multidisciplinary group of scientists, engineers and economists to address water management issues of national significance. The Centre's areas of strength are: Freshwater Ecology; Water Resources and Infrastructure Modelling; Soil Hydrology and Catchment Processes; and Water Quality, Treatment and Reuse.

The State Government is committed to reinforcing Adelaide's reputation as a 'University City'. That promise is coming to fruition with the University City Project, managed by the Department of Premier and Cabinet, which brings world-class universities to Adelaide to further develop skills education and research capacity in key areas such as water. Three new international universities have been established in Adelaide in recent years – Carnegie Mellon, Cranfield and, more recently, University College London. University College London will run a two-year Masters program in Energy and Resources from 2010.

In addition, the International Centre of Excellence in Water Resources Management (ICE WaRM) provides a national focus and international gateway to Australia's education, training and research expertise in water. Operating as WaterEd Australia, and based in Adelaide, the Centre was established in 2004 as an Australian Government initiative, with the support of the South Australian Government.

Australian Water Quality Centre

Responding to South Australia's challenging source water quality, SA Water has established the Australian Water Quality Centre, an internationally recognised centre of water quality expertise. Over 100 scientists provide laboratory and research advice and guidance in water quality and environmental management, water treatment and biological and chemical sciences. SA Water was instrumental in 1995 in establishing the Cooperative Research Centre for Water Quality and Treatment, which was based within SA Water and attracted over $150 million in water quality research funding. This has been superseded by Water Quality Research Australia, which has over 40 industry and research members and has also established its headquarters within SA Water, providing strong links with national and international research partners and international visitors.

The Waite Precinct

The Waite Precinct is a world-renowned co-located and collaborative research partnership between:

- the University of Adelaide
- CSIRO Divisions of Land and Water, Plant Industry, and Mathematical and Information Sciences
- the Australian Wine Research Institute
- the South Australian Research and Development Institute (SARDI), which is part of Primary Industries and Resources South Australia (PIRSA)
- the Department of Water, Land and Biodiversity Conservation
- a number of specialist groups, including three Cooperative Research Centres.

The Waite's unique collection of a number of Australia's leading agricultural and environmental research organisations is home to 1000 staff and postgraduate students. It is a model of research collaboration and technology incubation, with an established track record of delivering value to industry through innovative research and quality education. The annual research expenditure of the co-located partners is more than $110 million. The research precinct delivers outcomes of direct significance to Australia and other countries in terms of water management. More recently, it has been developing a stronger collaborative relationship with the Defence Science and Technology Organisation (DSTO). This relationship is being enhanced as a result of both research-to-researcher contact and the initiatives developed by the senior management of the two organisations.

Australian Cooperative Research Centres (CRCs)

There are currently about 70 CRCs in operation around Australia. Since the CRC Program started in 1990, it has attracted some $2.6 billion in Commonwealth Government funding and this has been used to leverage more funding from other public and private sector participants. The role of the CRCs is now more critical than ever, as Australia works to keep pace with a world driven by technology and innovation. The CRCs bring together the brightest minds from the public and private sectors, and the scientific, research and innovation communities – encouraging them to work together on core issues such as water. The CRCs promote science in action and aim to identify, support and facilitate the commercialisation and utilisation of cutting-edge innovation and technology. An example of their work includes Sustainable Water Supplies for Remote Communities of Indigenous People (Wright 2002). Of particular relevance to South Australia's water future are: eWater CRC (water modelling), Desert Knowledge (Desert communities), and Irrigation Futures (Innovative irrigation technology).

The Water Industry Alliance

The Water Industry Alliance (WIA) includes more than 100 South Australian-based companies and organisations seeking to grow through exports and form strategic alliances with water-related enterprises in Australia and offshore. Local water companies offer cutting-edge technology and extensive manufacturing expertise in a growing international market.

Currently, exports for water technology and services are estimated at 400 million (2007-2008). The Water Industry Alliance is confident that it can increase this figure to $1 billion by 2015.

While administration of the Alliance is funded 100 per cent by Industry, the State Government shares the cost of industry development and export initiatives through SA Water.

CSIRO (Water for a Healthy Country Flagship)

This program brings together scientific research capabilities from across Australia to address the sustainable management of our water resources and deliver relevant and effective water management options. With a total investment of approximately $86 million a year, the Flagship is the largest research partnership focusing on water in Australia. The partners include:

- CSIRO
- state and Australian governments
- private and public industry
- other research providers.

The Flagship aims to achieve a ten-fold increase in the economic, social and environmental benefits from water by 2025.

Centre for Comparative Water Policies and Law

The centre is a multidisciplinary endeavour established in the School of Commerce at the University of South Australia. It is a research concentration of the Hawke Research Institute for Sustainable Societies, and comprises lawyers, engineers and scientists, as well as researchers from other divisions of the university.

It aims to engage with, and be the focal point for, research into the legal, economic, social and cultural evaluation of Australian and international water policies and law.

Pricing and market instruments

Delivering a secure water supply into the future will require a mix of supply and demand measures. Efficient pricing and market reform will be integral to achieving the structural adjustment required by:

- encouraging the careful use of water and wastewater resources in a way that best reflects their value
- stimulating efficient investment in water and wastewater storage, supply and reuse infrastructure.

Achieving these reforms will benefit the State and will protect the long-term interests of customers. The Government recognises the importance of protecting low-income households, within this context.

Key points

- commitment to national reforms for water pricing, markets and related institutional arrangements under the National Water Initiative (NWI) and other Council of Australian Governments (COAG) agreements remains essential to the delivery of a secure and diversified water supply
- market-based approaches are the most efficient mechanism for setting prices and for encouraging competition and innovation
- in many cases, water and wastewater services are natural monopolies, meaning that competition is either not possible or is undesirable. In these cases, independent economic regulation can be used as a transparent means of setting price and service standards to help protect the long-term interests of customers, and stimulate efficient investment in infrastructure
- water and wastewater prices should reflect the full cost of producing and supplying those products and services (including environmental externalities where feasible and practicable) so that customers are encouraged to use water and wastewater services efficiently
- while water conservation can best be encouraged through cost-reflective pricing, equity can best be delivered through targeted income support (concessions) measures
- regional communities using SA Water's networks will continue to be supported through the application of statewide pricing, with costs reported transparently in the State Budget
- unless otherwise stated, references to water in this chapter refer to drinking and recycled water products, services and infrastructure
- reference to urban and regional customers includes customers in cities and towns, as well as primary producers who rely on SA Water supplies
- reference to irrigators does not include primary producers who rely on SA Water supplies.

Actions and outcomes

Outcome
Long-term interests of customers are protected through comprehensive, independent economic regulation of urban and regional water and wastewater services.

New action

- Appoint ESCOSA as the independent economic regulator for monopoly suppliers of urban and regional water and wastewater services in South Australia. This will apply to SA Water's potable water and wastewater services in the first instance.

Outcome
Strengthened price signals encourage efficient water use.

New actions

- Initiate a transition to a single potable water use price for SA Water's non-residential customers
- In consultation with customers, and over a period of up to five years, transition SA Water customers to water supply charges based on the number and size of the customers' meters whilst managing unreasonable impacts for individual customers

- Request the independent regulator, in the medium term, to examine price structures that may benefit economic efficiency and water security
- Develop State-based recycled water pricing principles to ensure competitive pricing of these emerging water sources.

Actions under way

- Continue to move potable water use prices for SA Water customers towards cost-reflective prices
- Bill SA Water customers for consumption on a quarterly basis to provide more timely information regarding water use
- Identify the costs of providing water planning and management in South Australia, introduce a water planning and management cost-recovery framework, and set charges in accordance with it from 2011-12.

Outcome

Customers have equitable access to essential water, wastewater and related services.

New actions

- Set water and wastewater prices to encourage economically efficient use and continue to support low-income households through transparent, targeted concessions schemes
- Require the independent regulator to monitor and report on the effect of statewide pricing.

Action under way

- Continue to support regional communities using SA Water's networks through the application of statewide pricing and report costs transparently in the State Budget.

Outcomes

The State-owned water infrastructure, currently managed almost entirely by SA Water, will have been opened up to provide third-party access, and new entrants in the water industry will be offering a range of fit-for-purpose water products.

By fostering markets and competition, new and innovative sources of water are provided at the lowest cost, while still meeting defined health, environmental, security and customer service standards.

Increasingly open and competitive markets for water at a household and industry level leading to mature and competitive market arrangements, where full retail competition could be available to consumers.

New actions

- Maintain government ownership of SA Water and develop a State-based third-party access regime that allows water and wastewater suppliers to access the water and wastewater infrastructure. Any such access will require licensing to ensure protection of public interest, public heath and the environment
- Explore the merits of innovative and competitive arrangements, in the medium term, which could allow for competition in the supply of bulk water, recycled water and retail services to customers, while retaining Government ownership of the public water supply infrastructure.

Discussion

National challenges and reform

In recognition of the water challenges facing Australia, water reform at the national level has incorporated the need for pricing changes and market restructuring.

States and territories have been working towards delivering the 1994 and 2004 COAG reforms, including changes to water management regimes, separating water access entitlements from land titles, separating the functions of water delivery from that of regulation, and making explicit provision for 'environmental water'.

More current water reform objectives are now incorporated within the National Water Initiative (NWI). Figure 37 outlines the NWI pricing outcomes.

The Commonwealth Water Act 2007 provides for the adoption of water market rules and water charge rules to apply in the Murray-Darling Basin. The Australian Competition and Consumer Commission (ACCC) is providing advice on these rules and has a role in enforcing and monitoring compliance with the rules.

In November 2008, COAG agreed to improve the security of urban water by adopting an enhanced national urban water reform framework, including the finalisation of NWI pricing principles. These principles remain in draft and are likely to apply only where the *Commonwealth Water Act 2007* does not.

As far as possible, South Australia is working to progressively implement these national reforms and pricing principles.

Protect long-term interests of customers through comprehensive regulation

Where natural monopolies exist, market forces cannot be relied upon to control prices, so other mechanisms may be used to protect the long-term interests of customers.

Economic regulation aims to reproduce the disciplines of competition by ensuring that the monopoly supplier does not earn excessive profits, or provide sub-standard services. Prices set under these arrangements should enable the monopoly supplier to recover the costs of efficiently operating and maintaining the network assets, and earn a reasonable return on investment.

Urban and regional regulation

Natural monopolies

SA Water's water and wastewater distribution networks are considered natural monopoly services, as it would be inefficient to duplicate facilities and have more than a single supplier.

There are examples of other suppliers providing localised potable water supplies and wastewater services to townships and regional areas and alternative water products within the urban and regional area. As competition in the water industry increases, these existing and new supplies will need to be reviewed to assess whether monopoly characteristics exist, and to determine whether the benefit of applying independent economic regulation would exceed the costs of regulation.

An independent economic regulator

The NWI requires the use of independent bodies to set or review

prices, or price setting processes, for water storage and delivery by government water and wastewater suppliers. To meet this obligation, ESCOSA reviews the processes by which the State Government sets urban and regional water and wastewater prices to be charged by SA Water.

While this arrangement is consistent with South Australia's commitments under the NWI, the National Water Commission has recommended that strengthened independent economic regulation is important for achieving improved water pricing outcomes.

The Water Services Association of Australia (WSAA) also supports water prices being set by an independent price regulator in its *Vision for a Sustainable Urban Water Future Position paper.*

Independent economic regulators already recommend, determine or approve urban and regional water and wastewater prices in New South Wales, ACT, Tasmania, Western Australia and Victoria. In Queensland, the economic regulator provides oversight where matters are referred to it by the Queensland Government and further reforms are being recommended and implemented.

Figure 37
NWI Pricing Outcomes

The pricing outcomes outlined in the National Water Initiative seek to:

- promote economically efficient and sustainable use of water resources, water infrastructure assets, and government resources devoted to the management of water
- ensure sufficient revenue streams to allow efficient delivery of the required services (but avoiding monopoly rents)
- facilitate the efficient functioning of water markets in both rural and urban settings;
- give effect to the principle of user pays
- achieve pricing transparency
- avoid perverse or unintended pricing outcomes.

The specific actions designed to achieve these outcomes include:

- consumption-based pricing
- full cost recovery for water services to ensure business viability and avoid monopoly rents, including recovery of environmental externalities, where feasible and practical
- consistency in pricing policies across sectors and jurisdictions where entitlements are able to be traded
- development of pricing policies for recycled water and stormwater that are congruent with pricing policies for potable water, and stimulate efficient water use regardless of the source
- review and development of pricing policies for trade wastes that encourage the most cost-effective methods of treating industrial wastes, whether at the source or at downstream plants
- development of national guidelines for customers' water accounts that provide information on water use relative to equivalent households in the community.

NWI reference to rural and regional supplies refers to water and wastewater services provided for rural irrigation and industrial users and in regional urban areas with less than 50,000 connections. Urban supplies refer to those supplies not included as rural and regional supplies.

Independent economic regulation has the potential to contribute to water security by:

- facilitating price structures that promote efficient water use and investment decisions consistent with government policies
- providing greater certainty for the funding of capital investment
- enhancing the outcomes that would be expected from market-based approaches
- helping to clarify roles and responsibilities for activities including supply-demand planning
- formally incorporating the requirements of other regulators, such as the Environment Protection Authority and the Department of Health, into the regulatory decision-making process.

To deliver these benefits, and as a first step towards pursuing other reforms, ESCOSA will be appointed as the independent economic regulator for urban and regional water and wastewater services in South Australia.

ESCOSA already has the power to regulate essential services in South Australia under the existing legislative arrangements of the *Essential Services Commission Act 2004* and has had exposure to the issues involved with urban and regional water and wastewater price setting. Water industry-specific legislation (the Water Industry and Planning Bill), to be introduced, will enable ESCOSA to undertake its functions in relation to water and wastewater services.

ESCOSA will begin its role in respect of water and wastewater services provided by SA Water's monopoly network. ESCOSA will have the power to regulate other monopoly water and wastewater suppliers as necessary.

The role of ESCOSA

ESCOSA will determine water and wastewater prices for monopoly service providers and undertake other regulatory functions as determined by the Government. The Government will develop a regulatory framework to:

- define the services to be regulated
- establish a clear separation between economic objectives, to be pursued by ESCOSA, and non-economic objectives (i.e. health, social and environmental objectives) to which ESCOSA must have regard, but for which the State Government will retain primary responsibility
- outline the pricing principles and methodologies to be applied by ESCOSA in undertaking its regulatory functions.

The regulatory framework will ensure that regulatory bodies, such as ESCOSA, the Environment Protection Authority and the Department of Health, work together to ensure desired outcomes are delivered in an economically sustainable manner. The regulatory framework will also include consumer protection services as detailed in the Legislative and Regulatory changes section of Part 6.

Detailed work to develop the regulatory framework is required. The regulatory framework applied to the Victorian water industry, the Water Industry Regulatory Order (WIRO), is reproduced in Appendix 3 as an example of the matters which may be addressed in South Australia's water industry regulatory framework.

Regulated suppliers, such as SA Water, will pay the costs associated with regulation through licence fees.

Implementation

ESCOSA will not be able to determine prices until the Water Industry and Planning Bill is enacted. As such the Government will continue to determine prices until the legislation is enacted.

In the meantime, the Government will work with ESCOSA to ensure the necessary regulatory processes and frameworks are in place to enable water and wastewater prices to be determined by ESCOSA as soon as possible following finalisation of the legislation.

Action

Appoint ESCOSA as the independent economic regulator for monopoly suppliers of urban and regional water and wastewater services in South Australia. This will apply to SA Water's potable water and wastewater services in the first instance.

Irrigation regulation

Irrigators' water costs comprise the cost of the water right (in some cases), levies, licence fees and the price of the storage and delivery services provided, in the main, by the irrigation trusts but, in some instances, by SA Water or other providers under bulk water transport arrangements.

Bulk water prices

The price of a water right from the Murray-Darling Basin is determined by the Murray-Darling Basin water market and will be subject to the water market rules to be made under the *Water Act 2007*. There is no immediate need for additional independent economic regulation by South Australia of prices for bulk water sourced from the Murray-Darling Basin.

Licence fees and levies

Where water is sourced from a prescribed water resource, irrigation operators, like other users, pay a licence fee to extract the water. The licence fees mainly comprise charges that recover the costs of water planning and management.

In addition, under the *Natural Resource Management Act 2004*, licence holders are charged an annual levy that is paid to the regional NRM Board and contributes to the activities undertaken by the board for water planning and management.

Independent review of the setting of these charges is discussed in more detail under Water Planning and Management Charges.

Storage and delivery charges

The *Irrigation Act 2009* and the *Renmark Irrigation Trust Act 2009* give irrigation trusts the power to impose rates for water supply and drainage in their districts so they can recover the costs of these services. Irrigation trusts set water storage and delivery charges for their respective districts in consultation with their customers. The four major irrigation trusts currently levy a fixed charge and a usage charge for storage and delivery services.

To date, there has been no independent regulation or review of irrigation water storage and delivery charges within South Australia, although the Renmark Irrigation Trust may not impose rates

without approval from the Minister for the River Murray.

Under the *Commonwealth Water Act 2007*, charges payable to irrigation infrastructure operators will be required to comply with water charge rules established under the Act. The Australian Competition and Consumer Commission (ACCC) will have a role in regulating water storage and delivery charges in the Murray-Darling Basin.

The ACCC draft advice on the water charge rules infers that the benefits of determining charges for South Australian irrigation trusts would most likely be outweighed by the costs. As a consequence, it is likely that South Australian irrigation trusts will be required to publish water charge information in accordance with the water charge rules. This will be an important first step to ensuring transparency.

These new regulatory arrangements are likely to capture most of the available gains from strengthening independent economic regulation of irrigation operators in the Murray-Darling Basin, and therefore it would be unnecessary to implement additional regulatory reform for irrigation water storage and delivery service charges at a state level.

Irrigators who source water outside the Murray-Darling Basin are generally individuals or small groups who have fully funded the water supply infrastructure and associated operating costs. There is not a strong case for implementing independent regulatory arrangements for this sector at this time.

We will continue to monitor developments in the water charge rules for the *Water Act 2007* to assess whether State Government involvement in price setting for irrigation storage and delivery services is required.

Strengthen price signals to encourage efficient use

Water prices provide signals to customers about their water consumption and investment decisions.

Prices that reflect the full cost of producing and supplying water and wastewater services (including environmental externalities where feasible and practical) encourage the efficient use of water and wastewater services. Cost-reflective prices are part of the solution for managing demand and possibly minimising the level and frequency of mandatory water restrictions.

Cost-reflective prices provide incentive to consume an extra unit of water only if the value the customer places on that consumption is at least as high as the expected cost of providing it in the long run.

Long-run marginal cost (LRMC) is a forward-looking cost benchmark incorporating estimates of long-run marginal operating costs and capital costs. It is used as a guide to setting cost-reflective prices. The latest best estimate of LRMC is in excess of $2 per kL (2009-10 dollars).

Cost-reflective prices can signal the need for new investment by existing or new industry participants and potentially defer the need for supply augmentations.

Cost-reflective pricing of potable water supplies may encourage investment in alternative water supply options, and thereby improve water security. As the cost of producing and supplying water using existing arrangements increases and pushes up water prices, it becomes viable to augment supply in ways that were previously not considered cost-effective. This may include innovative options such as water recycling and investment in water-efficient appliances. Cost-reflective pricing is critical for encouraging the most efficient mix of water sources.

Much of the recent commitment to major infrastructure investments across Australia has been heavily influenced by water security considerations, as opposed to ongoing water supply needs. This distinction between water supply and water security is important.

Continued restructuring of South Australian water pricing can and should make a major contribution to water supply and security over coming years.

Urban and regional drinking water prices

Key features of current drinking water prices for SA Water:

- water prices consist of two elements: a fixed (supply) charge and a volumetric (water usage) price, which rises with consumption under a three-tier inclining block structure
- the price for each inclining block is below the cost-reflective price (LRMC)
- a discount is offered for the first inclining block. This price applies to approximately one-third of all water used by SA Water customers
- uniform water prices apply to SA Water's urban and regional customers through application of a statewide pricing policy
- most customers are charged for water use on a bi-annual basis, although some large customers are billed quarterly.

In recent years, the Government has implemented reforms to move toward full cost-reflective prices and these reforms will continue in the coming years.

As a result:

- water revenues are moving towards full cost recovery by taking a transitional path that seeks to manage impacts on customers
- water bills are moving towards a stronger 'user pays' structure
- water prices are rising to meet the cost of the significant investment that will be required to augment available urban and regional water supplies.

The Economic Development Board (EDB) has acknowledged recent action to make water prices more cost-reflective to support necessary investment for water security. The EDB has stated that further restructuring of SA Water pricing can make a major contribution to water supply and security and that this is the fairest and most equitable way of paying for costly projects, such as the Port Stanvac desalination plant. It is critical that urban and regional water prices support the challenge of addressing restricted water availability and the emergence of a diverse range of alternative supply sources.

Water usage prices

A single volumetric price, reflecting the long-run marginal cost (LRMC) of supply, provides the most economically efficient water use signal to customers. The NWI pricing principles note that water use prices may include more than one tier for policy reasons, but where more than one tier is adopted, prices should have regard to the LRMC of supply to promote sustainable water use.

For residential water use, a three-tier inclining block structure will be retained. This means customers will be charged a higher price per kL of water as consumption increases, similar to the structure shown in Figure 38. Retaining inclining blocks is driven by a desire to:

- manage the impact on residential customers by smoothing the transition to higher water use prices over a period of time
- ensure social equity considerations are adequately provided for until equity instruments can be fully separated from the pricing policy
- retain conservation signals for residential customers using higher levels of water.

In its *Vision for a Sustainable Urban Water Future*, WSAA confirms that inclining block structures across Australia have begun to send stronger price signals to urban high water users.

Non-residential customers are currently afforded the same discount for water use as residential customers, up to 120 kL as shown in Figure 39. In most cases, the cost of 120 kL of water is not a major component of non-residential water bills. While discounting water use up to 120 kL for residential customers may be justified on social equity grounds, the same

Figure 38

2009-10 Residential Inclining Block Prices

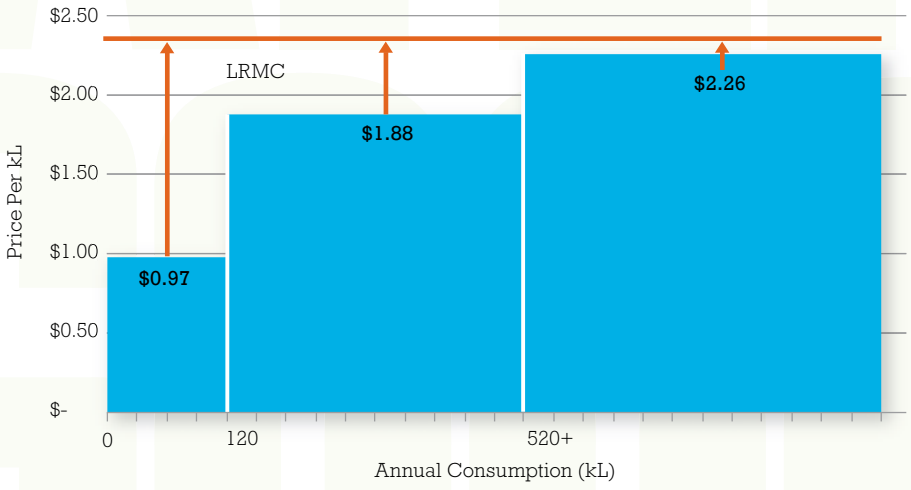
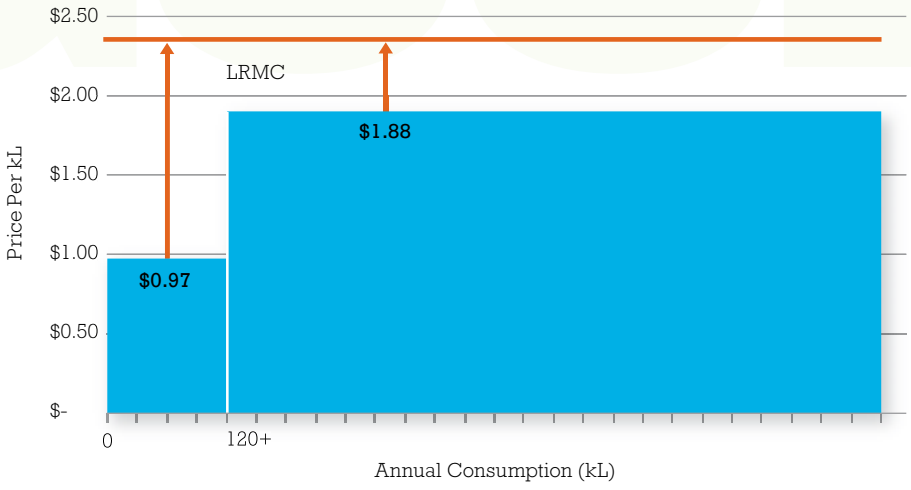


Figure 39

2009-10 Non-Residential Inclining Block Prices



discounting may not be justified for non-residential customers. Non-residential customers will be transitioned to a single water use price.

Recognising that cost-reflective water use prices provide the most economically efficient water use signal to customers, residential and non-residential prices will continue to gradually transition towards the estimated LRMC.

Options to reduce transitional impacts for residential and non-residential customers will be considered.

Action
Initiate a transition to a single potable water use price for SA Water's non-residential customers.

Action
Continue to move potable water use prices for SA Water customers towards cost-reflective prices.

Water supply charges

While water usage charges provide strong signals for efficiency, supply charges are important to ensure sufficient revenue is raised to fund efficient operating costs and capital investment. Over time, some anomalies in the apportionment of supply charges between residential and non-residential customers have arisen. For example, residential and most industrial customers pay a standard supply charge, while commercial customers pay a supply charge based on property values.

To remove these anomalies, supply charges for all SA Water customers will transition to supply charges based on the number and size of meters. Meters come in different sizes depending on the flow rate required – or potentially required – by the user (e.g. residential meters are smaller than most industrial meters). Supply charges based on meter number and size are used in other states and territories, including New South Wales, Western Australia and the Northern Territory.

For example, under a system of supply charges based on the number and size of meters, a motel would pay more than a residence because of its potential to use more of the network's capacity. Supply charges reflect the potential demand a customer might make on the system, as distinct from the actual demand that is reflected in the water use price. Signals of potential demand are important for planning future augmentation of water supplies. This approach will ensure that, after the transition, no customer will receive a water charge based on property value.

A consultative process will be undertaken to assess the impacts of this structural price reform on affected customer groups. Financial support will be considered in the design and implementation of these reforms to manage transitionary impacts that unreasonably affect individual customers. To allow sufficient time for consultation, and to smooth the impacts for customers, a transition to water supply charges based on the number and size of meters will commence from 2011-12 and be implemented over a period of up to five years.

Action
In consultation with customers, and over a period of up to five years, transition SA Water customers to water supply charges based on the number and size of the customers' meters whilst managing unreasonable impacts for individual customers.

Alternative price structures

The reforms to price structures already discussed are considered the priority for water security in the short term. Once these reforms have been sufficiently progressed, the independent economic regulator may be asked to review the case for alternative price structures that may benefit economic efficiency and water security. These reviews may include, but not be limited to, a review of water use prices, supply charges, wastewater charges, or other related charges such as developer charges and trade waste charges.

In the development of this Plan, the use of scarcity pricing was considered. Scarcity pricing involves setting the volumetric price for water so it varies with availability. The implementation of scarcity pricing is a complex matter and its benefits are not clear.

Action

Request the independent regulator, in the medium term, to examine price structures that may benefit economic efficiency and water security.

Metering and billing

From 1 July 2009 residential customers will be billed for water use every three months. This will ensure customers receive accurate information about their consumption quarterly, rather than half yearly. More timely water use information may alert customers to consumption problems (e.g. leaks) and also encourage changes in water use behaviour.

As discussed in Part 4 - *Managing our water future*, the use of smart water meters is being considered as another mechanism to encourage changes in water use behaviour. Wider adoption of smart meters could provide a platform for future price reform, however the benefit would need to outweigh the cost. Results of the pilot study under way will continue to be monitored.

Action

Bill SA Water customers for consumption on a quarterly basis to provide more timely information regarding water use.

Urban and regional wastewater charges

Wastewater charges in South Australia are currently based on property values, subject to a minimum charge, and have no volumetric component. The largest 50 trade waste customers are the only exception who are metered and charged a usage charge based on the content of the discharge.

While introducing a widespread volumetric charge for wastewater services for all users could provide signals to some customers regarding the effect their activities have on wastewater infrastructure, the costs of metering all customers would be significant. The complexities of using water usage as a proxy for wastewater volumes would be problematic. ESCOSA has acknowledged that wide use of consumption-based pricing for wastewater, using metering, may be impractical in the South Australian context.

Moving from a property-based charge to a fixed charge for wastewater services has no significant water security benefits. Fixed charges, like property value-based charges, do not signal the impact users are having on the wastewater system. Reform to wastewater charges may be considered for other policy reasons in the future but is not considered a priority in the context of the **Water for Good** Plan.

Recycled water and stormwater prices

Recycled water and stormwater are becoming more significant components of the total water supplied to South Australians. For example, SA Water recycled 31 per cent of its wastewater in 2007-08, which was predominantly used for irrigation. Local schemes are also being developed for stormwater harvesting.

Pricing for the supply of recycled water is currently undertaken by special agreement (i.e. negotiated on a case-by-case basis) and in some cases prices may not fully reflect the costs of production and supply. A key challenge facing Australia is the development of pricing policies for recycled water and stormwater that match, or are similar to, pricing policies for potable water. The aim is to stimulate efficient water use regardless of the source.

Under the National Water Initiative, a group of state government agencies and economic regulators has developed draft pricing principles for recycled water and stormwater reuse. The application of these draft principles will help give more transparent and efficient price signals to customers and provide a basis for developing an optimal mix of supply options to address water security.

In South Australia, nationally consistent state based recycled water and stormwater pricing principles will be developed. Victoria and New South Wales have already developed their own principles and Western Australia is moving in this direction.

Action

Develop State-based recycled water pricing principles to ensure competitive pricing of these emerging water sources.

Water planning and management charges

Water planning and management relates to activities associated with managing the resource sustainably, and planning for current and future use of the resource. To the extent that these functions are necessary, there is a case for recovering these costs from those accessing the water. Charging for water planning and management activities provides a signal to consumers regarding the cost of their water use decisions and, in some cases, may make other sources of water more attractive.

The NWI requires states and territories to identify the costs of water planning and management attributable to water access entitlement holders, and to link charges as closely as possible to the cost of these activities. Draft NWI pricing principles have been prepared in order to achieve a consistent approach across Australia. These obligations are largely mirrored in the water charging rules outlined in the recently enacted *Commonwealth Water Act 2007*. Across Australia, the calculation and application of water planning and management charges varies widely.

The South Australian Government undertakes and contributes to a wide range of water planning and management activities. A mixture of state-based levies and licence fees and Government funding is applied to recover a portion of the costs.

There is scope for water planning and management charges to recover more of the costs, to more closely link the charges to the drivers of the costs, and to ensure consistent application across users. An examination has begun into how water planning and management costs can be attributed to users on the basis of benefit received, or impact on, the resource. Work will continue in this area and effective systems will be developed to identify, collate and attribute water planning and management costs.

The issues involved in considering water planning and management charges are complex, and there is not necessarily a single optimal approach. It is not desirable to make fundamental changes in South Australia that might subsequently require further change to be consistent

with national requirements. The implications of national reform will be investigated before significant reform to water planning and management charges is proposed.

When the water charge rules under the *Water Act 2007* are finalised, a final decision will be made regarding the framework for water planning and management charges. In South Australia from 2011-12, these charges will be calculated in accordance with this new framework and published.

Action
Identify the costs of providing water planning and management in South Australia, introduce a water planning and management cost-recovery framework, and set charges in accordance with it from 2011-12.

Externalities

When setting prices, consideration should be given to the full cost to society of providing the water, including the costs or benefits arising from an individual's consumption that affects others, such as social and environmental impacts. These impacts are known as externalities.

An example is the Commonwealth Government's commitment to introducing an emissions trading scheme. This scheme will place obligations on organisations that emit greenhouse gases to acquire and acquit permits in proportion to those emissions. Electricity generators will be liable under the scheme, and this will be reflected in electricity prices. As water suppliers use electricity to deliver services, they will incur these higher costs that will be then be reflected in water prices. The emissions trading scheme will ensure that the cost of the greenhouse emissions associated with water consumption is factored into the end user's costs and, therefore, consumption decisions.

Externality pricing seeks to account for these costs. Externality pricing is difficult to implement but consistent with the NWI commitments, the State Government will continue to consider options for pricing to incorporate positive and negative externalities.

Ensuring equitable access to water

Low income households

Moves towards cost-reflective pricing will be accompanied by measures to reduce the impact of price increases on low-income households.

Water policy objectives should be considered separately from the broader issues of relative economic disadvantage, i.e. water conservation can best be achieved through pricing mechanisms, while equity considerations can best be delivered through targeted income support (concessions) measures. Separation of these policy matters will become more important in a water industry that is open to potential competition. Responsibility for the water concessions was recently transferred from the Minister for Water Security to the Minister for Families and Communities.

As a first step to concession reform, in 2007 and 2008 the water and wastewater concessions policy was reviewed and eligibility and entitlements were increased. The outcomes of recent national reviews of income support and taxation arrangements are also being monitored, as they may influence the approach to state-based concessions in the future.

The impact of water pricing reform on low-income households will continue to be monitored and, to the extent practical, these concerns will be addressed through separate, targeted concession arrangements provided by the Commonwealth Government.

Action
Set water and wastewater prices to encourage economically efficient use and continue to support low-income households through transparent targeted concessions schemes.

Regional communities

Regional communities using SA Water's networks will continue to be supported through the application of statewide pricing. A Community Service Obligation (CSO) payment will fund this State Government commitment. As the price of drinking water increases, the need for CSO payments may reduce, thereby providing a stronger incentive for investment in regional water schemes.

Action

Require the independent regulator to monitor and report on the effect of statewide pricing.

Action

Continue to support regional communities using SA Water's networks through the application of statewide pricing and report costs transparently in the State Budget.

Fostering markets and competition

Reforms to enhance markets and foster competition in other utility sectors have provided better incentives for efficient supply and demand. For example, in the electricity sector, where national wholesale and retail markets have been established, reliability across Australia has improved and there has been significant investment in new generation and network capacity, in many cases involving the private sector. In addition, as prices better reflect costs, people have changed their behaviour and become more efficient in their use of electricity. Many have invested in demand management technologies, such as solar power and energy-efficient appliances.

Market-based approaches are being considered in the water sector as an alternative to the exclusive reliance on monopolies providing all or most services. Market reform has the potential to create opportunities for new and diverse supply sources and innovation in water supply.

Markets are not new in water supply in South Australia. Irrigators, SA Water and the State Government already participate in the water market in the Murray-Darling Basin. Economic, environmental and social benefits have resulted from the ability to re-allocate water to higher-value uses. Through contracting, there is also substantial private sector involvement in SA Water's operations. Examples include the operation and maintenance of metropolitan water and wastewater services by United Water, and the building, operation and maintenance of regional wastewater treatment plants by Riverland Water.

A number of market-based options, requiring only modest changes to institutional and regulatory arrangements, have the potential to make a significant contribution to water security. These will be pursued as a priority before more costly alternatives are considered.

Water markets

End user entitlement trading involves defining and providing tradable entitlements and periodic allocations to end users of water, and allowing a market clearing mechanism to determine the value of the water.

Mandatory end user entitlement trading, particularly models that involve households, appears to be the least practical market-based option in the South Australian context. While it could offer benefits in terms of more efficient allocation and use of limited resources, it would involve significant administration and transaction costs. It would involve establishing the entitlement regime and trading framework, defining individual entitlements, establishing and maintaining registers, processing and participating in trades, and adhering to regulatory requirements, such as reporting. There may also be equity and health concerns regarding these arrangements.

Larger users, however, may have potential to access water without the associated administrative changes. Voluntary end user trading, using the existing Murray-Darling Basin water market, offers a major potential water source for managing water security in South Australia. This option would enable water to flow from lower-value higher-value uses, based on informed choices by buyers and sellers. Access to SA Water's transport network would be required to ensure these options were fully exploited.

Part of the challenge is the barrier on water trading within the Murray-Darling Basin. It is not expected that the caps will be abolished completely until 2014. The South Australian Government believes this cap needs to be lifted well before 2014 to ensure both water security for South Australia and environmental protection.

In the interest of removing barriers to trade, the State Government will continue to participate in reforms and interstate forums that encourage more efficient operation of the Murray-Darling Basin water market.

Third-party access

Allowing new entrants access to existing monopoly infrastructure is a necessary step to encourage the entry of new, innovative and diverse supply sources, including non-rain-dependent sources. Access may help to achieve economically viable investment and encourage efficient use of urban and regional water and wastewater infrastructure. The Economic Development Board has specifically recognised the need for private suppliers to be given third-party access to Adelaide's main trunk networks for water and sewerage.

In practice, third-party access could involve a company securing its own water supply and accessing SA Water's network to deliver the water to customers. Alternatively, a competitor could source wastewater and use SA Water's wastewater network to transport this to a treatment plant for sale to recycled water customers. The greatest opportunities for access may be in supplying non-residential customers.

In South Australia, as in other states, there are significant regulatory and other hurdles for competitive entry into water or wastewater service provision. They include legislative barriers and lack of a formal licensing regime for suppliers. Despite this, potential entrants do have the ability to request access to monopoly water and wastewater infrastructure through negotiated arrangements, or through an application via Part IIIA of the *Trade Practices Act (TPA)* 1974. SA Water has negotiated third-party access arrangements, including an arrangement with Barossa Infrastructure Limited for bulk transfer of water from the River

Murray to the Barossa region, and arrangements with other parties for off-peak transportation of bulk water.

An alternative approach would be to develop a state-based access regime. This would encourage innovation and provide greater certainty for potential entrants as they would be able to gain access to the monopoly facilities on fair and reasonable terms.

Several states are considering a move to this kind of regime. NSW has made the most progress and the National Competition Council has released its preliminary view that, based on the information presented to date, its intention would be to recommend certification of the regime. Victoria, Western Australia and Queensland have also indicated an interest in doing so.

South Australia will develop a state-based access regime that allows suppliers, licensed by ESCOSA, to access monopoly water and wastewater infrastructure and therefore compete in the provision of water and wastewater services.

A state-based access regime for South Australia will include:

- provisions to allow access
- a licensing regime to regulate the involvement of the private sector in the supply of water or wastewater services. This will include provisions to protect public interest, public health and the environment
- development of customer protection arrangements via codes and other instruments
- provision for appropriate involvement of an independent economic regulator in facilitating access.

Action
Maintain government ownership of SA Water and develop a State-based third-party access regime that allows water and wastewater suppliers to access the water and wastewater infrastructure. Any such access will require licensing to ensure protection of public interest, public heath and the environment.

Other approaches
Other market-based options could contribute significantly to water security outcomes, and may offer broad reform benefits, including wider operational and dynamic efficiencies in the provision of water and wastewater services. These options include centrally planned restructures of the water industry, including the establishment of a centralised wholesale water market, or the adoption of retail competition and competitive procurement or sourcing.

These options involve complex issues which require further detailed consideration. They also would involve significant changes to the existing industry structure and arrangements and hence would incur significantly greater cost. These options will be investigated as longer-term alternatives.

Action
Explore the merits of innovative and competitive arrangements, in the medium term, which could allow for competition in the supply of bulk water, recycled water and retail services to customers, while retaining Government ownership of the public water supply infrastructure.

Legislative and regulatory changes

Key points

- the water industry in South Australia is changing, and so governance and institutional arrangements supporting the industry also need to change
- a new legislative model is needed to underpin a holistic and integrated approach to total water-cycle management
- this will foster and facilitate innovation and efficiency through competition and improved transparency
- environmental and consumer standards will be protected
- public health is the paramount consideration for managing drinking water quality.

Actions and outcomes

Outcome

A single, new *Water Industry & Planning Act* will be governing the operations of SA Water. The new legislation is the foundation for establishing a fresh approach to managing a more competitive and diverse water industry.

New actions

Release a discussion paper for consultation during 2009 outlining proposed new legislation: introduce new legislation in 2010

Work with the LGA to review and update the governance of the Stormwater Management Authority to ensure that appropriate emphasis is given to stormwater harvesting and reuse

Introduce legislative amendments to remove any prohibition on SA Water proactively taking a role in stormwater reuse

Give explicit statutory recognition to an Environmental Water Reserve through the *Natural Resources Management Act 2004*

Provide definitions for the various types of wastewater, and certainty as to ownership

Ensure excellent service and fair treatment through independent and transparent customer consultation, complaints processes and the establishment of a Customer Advocacy and Advisory Council

Give statutory force to water demand and supply plans and outline how these will be developed, implemented, reviewed and maintained

Give explicit statutory recognition to the concept of managing the water cycle and, of water security

Strengthen existing assurance of water planning and service delivery.

Outcome

Enhanced water quality standards and increasingly diversified supply sources.

New actions

Develop new legislation to ensure best practice water quality standards are maintained as supply becomes increasingly diversified

Provide for independent technical regulation of plumbing standards and practices

Continue to support world-leading research to assess the potential for treating stormwater to a very high quality and monitor future scientific developments and technological innovations. However, we do not intend to feed recycled water directly into the mains water system.

Water reform progress

In the past 15 years, South Australia has introduced a number of competition policy reforms to meet the National Competition Policy agenda. These include:

- establishing independent pricing processes for many monopoly or near monopoly government business enterprises
- disaggregating natural monopolies in the gas and electricity industries into competitive elements, and separating service provision from regulatory and commercial functions
- establishing an economic regulator for monopoly services such as gas, electricity and ports.

For the water industry, in particular, the reforms meant:

- corporatising South Australia's water utility, with the former Engineering and Water Supply Department becoming SA Water under the *South Australian Water Corporation Act 1994*
- giving the Essential Services Commission of South Australia (ESCOSA) responsibility for reviewing the processes for the setting of metropolitan and regional water and wastewater pricing for SA Water
- separating water resources planning and management from service provision, making the Department of Water, Land and Biodiversity Conservation responsible for the former, and SA Water responsible for the latter, as shown in Figure 40.

Contemporary water industry

The water industry has typically been a relatively stable service sector. In more recent times, however, climate change, climate variability, economic development initiatives and the national water reform agenda have generated many changes. They include:

- recognition of the reduced availability of water and the need for more careful management
- increasing use of recycled water from wastewater treatment plants, including local council community wastewater management schemes, and interest in sewer mining at a local level
- the introduction of the concept of water being a tradable commodity within a market that reflects the principle that it should be traded to its highest value use
- pricing policies that endeavour to more accurately reflect the full cost of providing water supply and associated services
- the introduction of new approaches such as desalination and aquifer storage and recovery
- use of alternative power sources for pumping and operating treatment facilities.

A larger population and increased exports will underpin the future of South Australia's economic prosperity. To achieve the growth planned, the water

sector will need to meet the State's needs in innovative ways. The availability of new water supplies and products, combined with increasing prices, are likely to attract further private interest in the market.

The combination of these factors warrants a major revision of governance and institutional arrangements

Approaches in other Australian states and territories

The shape of the legislative framework for water service delivery varies considerably throughout Australia, largely because of differing climates, geography, population and patterns of development. Despite these differences, in recent times there has been some consistency in the general approach to water governance. In all other Australian states and territories, the provision of water and wastewater services is regulated by specific water industry legislation. In general, this legislation:

- establishes an independent regulating body
- provides a price-setting mechanism
- controls entry to the industry
- specifies the services to be provided
- specifies the standards of service.

New legislation

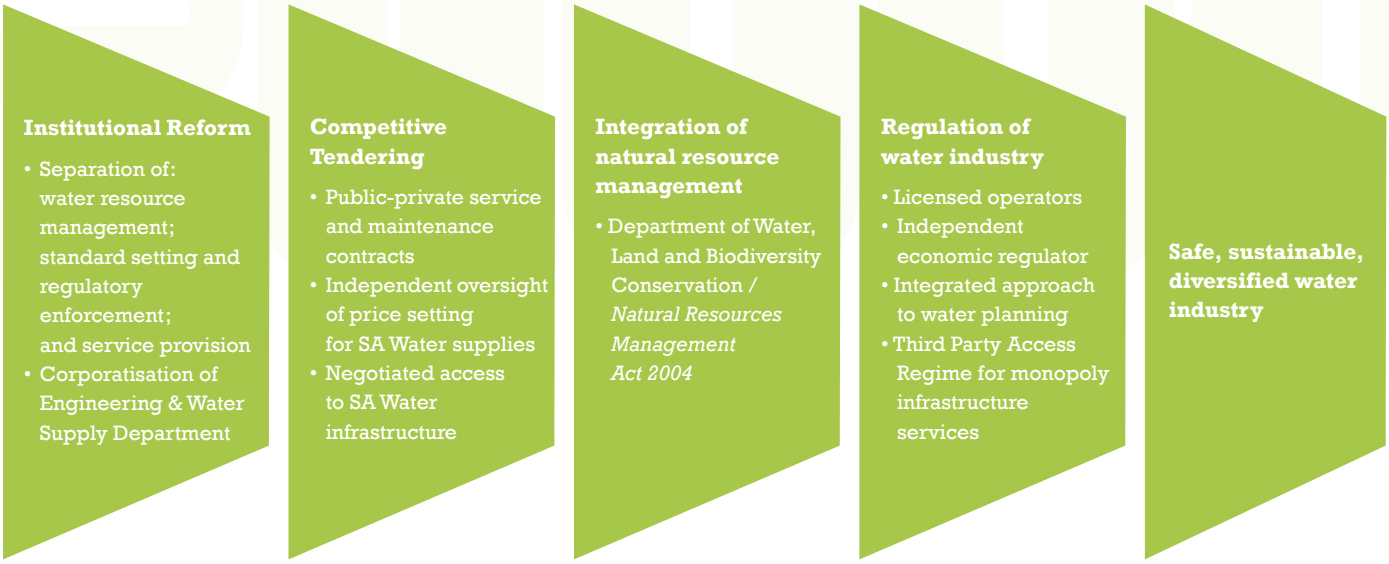
A discussion paper will be released in 2009 outlining the necessary regulatory controls for water supply planning, and recognition of the water sector as an operating market, through one new Act. This will clearly integrate water security with public and private investment in new and different methods of supply. The proposed legislation will:

- set out the governance arrangements for **Water for Good** planning and management
- complete the regulation of monopoly water suppliers by introducing economic regulation.

The proposed legislation will also incorporate necessary operational and other powers from the *Waterworks Act 1932* and the *Sewerage Act 1929*. It will complement provisions in other key acts, including: *Natural Resources Management Act 2004*, *River Murray Act 2003*, *Essential Services Commission Act 2002*, *Environment Protection Act 1993* and *Public and Environmental Health Act 1987*.

A number of older Acts will be repealed, including: *Waterworks Act 1932*; *Sewerage Act 1929*; *Water Conservation Act 1936*; *Metropolitan Drainage Act 1935*; *South-Western Suburbs Drainage Act 1959*; *Metropolitan Drainage Works (Investigation) Act 1957*.

Figure 40
Water reform



In addition, new drinking water legislation will ensure high-water quality standards are maintained as supply becomes increasingly diversified.

Actions

Release a discussion paper for consultation during 2009 outlining proposed new legislation: introduce new legislation in 2010

Develop new legislation to ensure best practice water quality standards are maintained as supply becomes increasingly diversified.

Water policy, planning and management

New water supply planning and industry legislation will identify water security as an essential factor influencing all aspects of society, the environment and the economy. The proposed legislation will provide the strategic framework and strong governance arrangements necessary for long-term water security policy, planning and management.

Strategic management

Institutional arrangements – planning process

A key element of a sustainable water strategy is monitoring the resource outlook and adapting the supply plan and timetable to reflect changes between forecasts and outcomes. The supply planning process is described in *Part 3 – The challenges of demand and supply.*

Accountability for water demand and supply planning will rest with the Minister responsible for administering the new Act, and that Minister's role will also be prescribed in legislation.

The Minister's role will entail:

- reviewing and reporting on the performance of South Australia's water system
- reporting on matters relating to the future capacity and reliability of the State's water system relative to forecast demand
- reporting on other water supply industry and market policy matters
- publishing an annual review of the prospective trends in the capacity and reliability of the State's water system relative to projected growth in customer demand
- establishing an independent planning body if demand and supply forecasts indicate a gap is likely to exist in the foreseeable future. The advisory body will make recommendations on options to be implemented to enable water supply standards to be maintained, having regard to quantity and quality requirements, and market responses
- reviewing this Plan and the regional water supply and demand plans on a five-yearly basis.

A range of factors influences decision-making about supply augmentation options for particular circumstances. They include timeframes to plan and implement, volume required and the cost of construction and operation.

It may be necessary to have identified and developed options in advance, and sought market input and testing.

Water demand and supply plans

The proposed legislation will give statutory recognition to this Plan and regional water demand and supply plans, ensuring that the short, medium and long-term targets contained in them are monitored, evaluated and publicly reported. The responsible Minister will be charged with preparing and maintaining those plans.

They will take into account, and complement, the State and regional Natural Resources Management Plans, the Planning Strategy, the Implementation Strategy under the *River Murray Act 2003* and, where applicable, Stormwater and Recycled Water Management Plans.

Action

Give statutory force to water demand and supply plans and outline how these will be developed, implemented, reviewed and maintained.

Recognition of total water-cycle management

The proposed legislation will recognise water as a resource that is unevenly distributed and occurs in many forms, all of which are part of the interdependent hydrological cycle. The legislation will define water security in a way that encompasses all water resources – both rain-dependent and non-rain-dependent – in the State.

Enshrining the concept of total water-cycle management in legislation sets the policy framework on which supply planning and delivery will be conducted.

Action

Give explicit statutory recognition to the concept of managing the water cycle and, of water security.

Stormwater

The Stormwater Management Authority

Significant advances were made in stormwater management policy with the signing of the Stormwater Management Agreement between the State Government and the Local Government Association in 2006 and the enactment of legislation to approve that agreement *(Local Government (Stormwater Management) Amendment Act 2007.*

Notwithstanding these advances in governance, there remain a number of parties involved in the management and regulation of stormwater. While this multi-agency approach is necessary when dealing with the complex journey of stormwater from catchment to sea, greater clarity around each agency's role, responsibilities and actions is required for each agency to best perform its part.

The harvesting and use of stormwater is becoming an increasingly important strategic consideration in meeting the demands on the State's critical water supplies. Stormwater must now be considered within the overall strategic context of the statewide management and regulation of all available water resources.

Accordingly, the State Government, in consultation with the Local Government Association, will review the governance arrangements for the Stormwater Management Authority to ensure they facilitate effective management of stormwater as an integral part of available water resources.

The review will consider the Stormwater Management Agreement between State and Local Government.

Action

Work with the LGA to review and update the governance of the Stormwater Management Authority to ensure that appropriate emphasis is given to stormwater harvesting and reuse.

As described in *Part 4 – Managing our water future*, with local government support, the Stormwater Management Agreement between State and Local Government will also be updated to reflect the proposed legislative changes. This will ensure significant attention is afforded to stormwater recycling in addition to achieving other important stormwater management objectives, including flood risk management and water quality improvement.

SA Water's role in stormwater management

In setting out its functions, SA Water's establishing legislation, the *South Australian Water Corporation Act 1994*, excludes 'stormwater' from the definition of 'wastewater' and is silent on the definition of 'water'. To date, this has not precluded SA Water from participating in a number of recent stormwater initiatives. However, it may interfere with the corporation's ability to be more active in this area in the future. The Act will therefore be amended to remove any ambiguity.

Action

Introduce legislative amendments to remove any prohibition on SA Water proactively taking a role in stormwater reuse.

Environmental Water Reserve

Environmental water is currently allocated through the Water Allocation Plan (WAP) process for prescribed water resources under the *Natural Resources Management Act 2004*. WAPs must:

- include an assessment of the quality and quantity of water required by local ecosystems, and determine whether the taking and use of water will have a detrimental effect on those ecosystems
- determine appropriate limits for the amount of water which can be diverted from a water resource for all uses to achieve an equitable balance between environmental, social and economic needs.

South Australia has been at the forefront of water allocation through the *Natural Resources Management Act 2004* and its predecessors. The water allocation plans required under that Act (and described further in the Planning section of this chapter) may set out what share of the resource needs to be kept in the system to maintain system health, end of system flow targets, groundwater levels or provide environmental water provisions.

Further refinement of this mechanism through the establishment of an explicit environmental water reserve (EWR) is one way of providing additional environmental water that is also secure during times of drought.

A reserve would identify environmental water as a separate and specific use by:

- enabling South Australia to have its own reserve of environmental water to direct to priority sites, and complement other environmental flows programs (e.g. Commonwealth Environmental Water Holder or The Living Murray)
- providing a transparent mechanism which industry and private individuals could use for donations
- providing a source of water that could be used to develop watering partnerships with industry and community groups, and which could be traded on the water market.

Notwithstanding the current dry conditions, some water is still made available for the environment during drought. This includes water from Commonwealth Environmental Water Holder and The Living Murray.

South Australia already has a River Murray Environmental Manager (RMEM) to obtain environmental water for the Murray in this State; prioritises environmental assets along the river and develops water bids for obtaining 'e-water'.

A South Australian environmental water manager whose role and function will be defined in the Act will manage the Environmental Water Reserve. The manager will be required to report to Parliament on 'e-water' use and donations.

The Environmental Water Reserve could potentially contribute to its own funding for delivery, monitoring and environmental infrastructure projects by temporarily trading the Reserve to other users in years when the water is not needed for environmental purposes, e.g. during wetland drying phases. Other funding will come from donations and the Save the River Murray Fund.

Action

Give explicit statutory recognition to an Environmental Water Reserve through the *Natural Rescources Management Act.*

Water quality

Nationally, regulation of water quality has been increasing as management functions are outsourced. Victoria and Queensland have recently developed specific legislation to ensure safe drinking water. While the present arrangements between SA Water and the Department of Health have been effective until now, with increasingly diversified supplies and potential new suppliers, it is timely to develop and implement more prescriptive safe drinking water legislation in South Australia.

Establishing a Safe Drinking Water Act in South Australia will provide a more clearly defined legal framework and ensure that existing roles, responsibilities and reporting arrangements are set out in law. It is proposed that the legislation require:

- the establishment of independently audited drinking water risk management plans
- provision of information in relation to monitoring programs and water quality reporting
- compliance with guideline values and incident reporting and response, according to protocols agreed with the Department of Health.

Action

Develop new legislation to ensure best practice water quality standards are maintained as supply becomes increasingly diversified.

Service delivery

Independent economic regulator

The Essential Services Commission of South Australia (ESCOSA) is currently responsible for the economic regulation of gas, ports and intra-state railway industries, as well as the Tarcoola to Darwin railway. ESCOSA also has a limited role in water whereby, at the direction of the Treasurer, it undertakes enquiries into Government processes for setting SA Water's charges for water and wastewater.

ESCOSA will take on the broader role of an independent economic regulator of monopoly service providers of water supply and wastewater services.

The functions of the economic regulator will ensure that current best practice governance standards are observed. The functions of the economic regulator are outlined in the Pricing and markets section of this chapter.

Licensing system

The Government will control the conditions and obligations under which a provider is allowed to operate through the regulatory mechanism of licensing. A licensing system will ensure that each operator complies with the health and environment legislation pertinent to a particular type of licence, and meets certain obligations in relation to consumer protection.

A licensing system provides a level playing field for all participants and enables the consistent application of standards. It also provides flexibility for Government, as policies and standards change over time. Licensing is the preferred regulatory approach throughout most utility sectors.

Third-party access regime

Third-party access is the ability of a party to apply for and be granted access to a monopoly's infrastructure services.

Third parties may be interested in supplying drinking water, recycled water or wastewater services. An access regime does not provide a right to obtain the resource itself.

The State's water infrastructure currently managed by SA Water will remain in Government ownership.

Water and wastewater service providers who gain access will need to be licensed to operate to ensure protection of public interest, public health and the environment. These arrangements are discussed further in the Pricing and markets section of this chapter.

In South Australia, a number of third parties have access to SA Water's infrastructure (e.g. Barossa Infrastructure Limited). These access arrangements have been agreed through negotiation and goodwill. While negotiation is still the preferred approach, a third-party access regime ensures the right to negotiate for access to the infrastructure.

If negotiations fail, the potential market entrant can have confidence that an independent regime is in place and that the dispute can be dealt with.

Supplier of last resort

The proposed legislation will enable the minister to appoint a 'supplier of last resort' that can step in where a licensed water or wastewater service provider fails to provide the required services. This mechanism is essential to provide consumer protection with respect to vital water services. SA Water has been required to perform such a role in the past.

Sewer mining

Before a sewer miner can tap into a sewer, extract the wastewater, treat it, use it, and discharge the residuals back into the sewerage system, agreement from the wastewater infrastructure operator is required. SA Water, the major wastewater infrastructure operator in the State, already permits sewer mining.

By convention, the owner of the sewerage infrastructure is considered the 'owner' of the sewage once it passes the property boundary. 'Sewage', however, is not defined in the Sewerage Act, or elsewhere, and no provision is made for ownership of the resource.

The proposed legislation will clarify rights of ownership and provide certainty and consistency in relation to sewer mining.

Action

Provide definitions for the various types of wastewater, and certainty as to ownership.

Technical regulator

Sound plumbing practice remains a key element in the protection of public health in the water and wastewater industry, especially in the context of that industry drawing supplies from a diverse range of sources.

The licensing, registration and professional behaviour of the plumbing industry is currently regulated under the *Plumbers, Gas Fitters and Electricians Act 1995,* by the State Office of Consumer and Business Affairs (OCBA), which is the primary occupational licensing body of the Government.

SA Water, under the waterworks and sewerage Acts, has been responsible for the technical regulation of plumbing associated with public infrastructure and, more broadly, the adoption of State-based plumbing standards. Local councils and the Department of Health regulate plumbing standards in areas not supplied by the public water system.

In an economic regulation environment, it is inappropriate for these State-based responsibilities to remain with a licensee, in this case SA Water. The proposed legislation will therefore provide for the appointment of a technical regulator of plumbing activities. This role will be similar to those within the electricity and gas sectors.

The functions and powers of the Technical Regulator will be to:

- set standards for plumbing activities, picking up on nationally agreed standards
- monitor, enforce and report annually on compliance with the standards.

The technical regulator will establish technical advisory committees, including representatives from water entities, contract or employee organisations involved in the plumbing industry, and local government.

This proposal supports the 2008 COAG agreement to develop a national trade licensing system in the context of the broader regulatory reform to achieve a seamless national economy. The proposed National Licensing System will initially apply to seven occupational areas, including plumbing and gas fitting.

Action

Provide for independent technical regulation of plumbing standards and practices.

Performance monitoring, evaluation and feedback

Good governance requires accountability, transparency, integrity, stewardship of common resources, leadership and efficiency. The outcome is confidence in the organisations delivering the services. This confidence is achieved through robust processes by which internal and external accountability is assured.

The proposed legislation will strengthen existing assurance of water planning and service delivery through:

- increased transparency in price-setting for monopoly services and other entities
- independent assessment of licensed entities' performance
- rigorous and transparent water planning
- legislated implementation and evaluation mechanisms
- public reporting of the effectiveness of planning and delivery
- integrated strategic management of the entire stormwater system from all drainage systems, creeks and rivers to the sea
- continued protection of public and environmental health within an expanded water industry.

Action

Strengthen existing assurance of water planning and service delivery.

Consumer protection

A formal process to deal with customer complaints and disputes is important to protect customers from poor service or unfair treatment.

Active participation by water users is a key component in water demand and supply planning. In a more complex water industry, a single point of advice from, and advocacy for, the various needs of water customers is also required.

The SA Water Customer Council was established in 2004 but this body is not established under legislation and is supported by SA Water. Provision will be made for the economic regulator to establish its own independent customer advisory committee. Licensees of regulated services will also be required to have customer consultation and complaints-handling mechanisms in place.

Action

Ensure excellent service and fair treatment through independent and transparent customer consultation, complaints processes and the establishment of a Customer Advocacy and Advisory Council.

Part 6

Fostering innovation and efficiency through planning, pricing, legislation and research

To ensure that we are on track to meet our vision and outcomes will require a robust and adaptive monitoring and assessment framework.

Part 7

Staying on track – implementation and monitoring

Part 7

Staying on track – implementation and monitoring

Introduction

Water for Good is an overarching integrated management plan that will see South Australia become an internationally-recognised water-sensitive State by 2050.

It contains more than 90 actions collectively designed to ensure that we have a secure and reliable supply of water to support economic, social and cultural development.

A vital component of the Plan will be the development of water demand and supply plans for every region of the State outside of Greater Adelaide. They will sit side-by-side with **Water for Good** and support and inform its delivery in the short, medium and long terms.

Tracking the implementation and achievement of this suite of actions – and the status of water demand and supply through these regional plans – will require a robust and adaptive monitoring and assessment framework.

This section outlines how we will achieve this.

Key Points

- The implementation of **Water for Good** will require the active involvement of all South Australians.
- An adaptive management framework has been developed to review the assumptions underlying demand and supply augmentation scenarios
- The Office for Water Security will undertake the development and review of all regional water demand and supply plans
- The assumptions in each regional water demand and supply plan will be reviewed annually
- If an annual review finds a substantial deviation from the original assumptions underlying demand and supply augmentation scenarios, a comprehensive review will automatically be triggered
- A comprehensive review of all regional water demand and supply plans will occur every five years, unless triggered earlier.

Discussion

The South Australian Government, industry, business and water consumers will need to work collaboratively to ensure the actions in this Plan can be achieved successfully.

Water Proofing Adelaide

Water Proofing Adelaide (WPA) 2005 is a 20-year strategy for the management, conservation and development of Adelaide's water resources. It contains 63 strategies and sets the target of reducing water use by 70 GL a year by 2025. The area covered by WPA encompasses the Greater Adelaide region, including Myponga, the Barossa Valley and the western Mt Lofty Ranges.

In July 2008, engineering consultants GHD undertook an independent review of WPA. This not only fulfilled the strategy's commitment to regular review but was also in response to significant changes in climatic conditions, new knowledge and policy development at both State and national levels.

The key findings of the review were:

- That nearly all of the strategies are 'on track' to be met, with 14 already completed
- The establishment of the Office of Water Security has provided a central point of contact and coordination and re-invigorated action among the agencies and stakeholders delivering WPA
- Water savings and additional water supplies achieved at the time of the review (approximately 15 GL/a on-going) represent about 20 per cent of the 2025 WPA target.

Water for Good Action Plan

Table 12 outlines all of the actions contained within **Water for Good** as well as any actions arising out of *Water Proofing Adelaide*.

Adaptive management framework
As outlined in Part 3 – *The challenges of demand and supply*, an adaptive management framework will be developed to ensure that decisions are made in a timely manner. This new framework will consider the following factors:

- a set of water security standards
- state of the resource
- demand pressures
- governance and management
- options and assessment process
- measuring and monitoring.

Annual review of assumptions
This Plan and the regional water demand and supply plans will be reviewed annually. These reviews will not only look at the status of demand and supply in each area but also the assumptions the plans contain. **Water for Good** will be examined for the first time in 2010. The regional plans will be reviewed 12 months after they are completed and approved.

The review process will assess assumptions against set water demand and supply criteria; identify matters that relate to any future issues and assess the reliability of the current water supply system relative to forecast demand. Both demand and supply forecasts will be updated as required.

The annual review process will provide an important check-point for significant investment decisions, and this could improve the cost effectiveness of projects. The review frequency is particularly important in the water industry, as significant lead times are often required for the design and construction of infrastructure.

An adaptive management framework requires a clear single point of authority so that management and monitoring are transparent, accountable and supported by science. In the medium to long term, the Government will examine options for an independent entity to oversee the annual review process and to ensure that triggers contained in plans are appropriately activated. The independent entity would ensure consistent monitoring of water demand and supply standards and note any changes, as well as assess all options and initiatives as they may arise. In the interim, the Office for Water Security will undertake this role.

Five yearly comprehensive reviews
All water demand and supply plans will be comprehensively reviewed and updated every five years, unless such a review has been triggered earlier.

In addition to reviewing the assumptions, the five-year comprehensive review and amendment will incorporate an assessment of the effectiveness of the plan to date.

Outcome
Water for Good and all regional water demand and supply plans are regularly and robustly reviewed and updated.

New actions
Undertake annual reviews of **Water for Good** and regional water demand and supply plans, checking both the status of resources and the assumptions on which the plans are based.

Undertake comprehensive review and amendment of **Water for Good** and regional water demand and supply plans on a five-yearly basis.

The Minister will publish an annual statement that will:

- assess progress and identify any risks or issues
- review and confirm water security standards for the upcoming review period
- provide a demand and supply status for each region
- identify and analyse impacts of any emerging issues.

Figure 41
Review Process

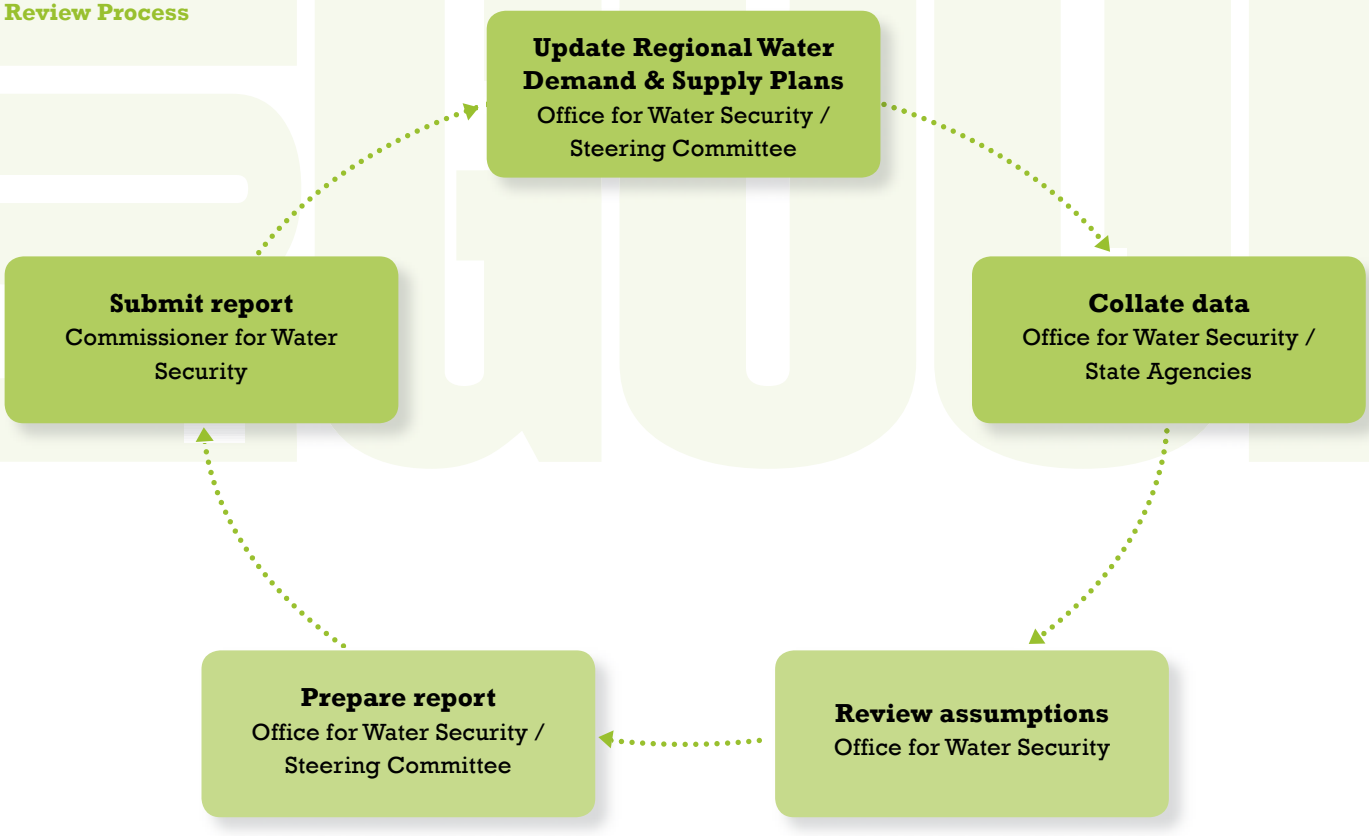


Table 12
Summary of Actions

Action	Start Date	Completion Date	Lead Agency	Partners
1. Establish an adaptable management framework, incorporating an annual review process, to assist in making timely and appropriate decisions to provide ongoing water security throughout the State.	2009	Ongoing	OWS	
2. The Minister will produce an annual statement that will: • assess progress of the Plan and identify any risks or issues • review and confirm water security standards for the upcoming review period • provide demand-supply status for each region • identify and analyse impacts of any emerging issues.	2010	Ongoing	OWS	SA Water DWLBC NRM Boards DP&LG
3. The Minister will establish an independent planning process if demand and supply forecasts indicate a gap is likely to exist in the foreseeable future.	As required	As required	Minister for Water Security OWS	DWLBC Department of Treasury & Finance Independent chairperson
4. Undertake annual reviews of **Water for Good** and regional water demand and supply plans, checking both the status of resources and the assumptions on which the plans are based.	2009	Ongoing	OWS	SA Water DWLBC
5. Undertake comprehensive review and amendment of **Water for Good** and regional water demand and supply plans on a five-yearly basis.	2014	Ongoing	OWS	SA Water DWLBC ESCOSA
Desalination				
6. Construct a major desalination plant powered by renewable energy to supply Greater Adelaide with 'first water' by December 2010, 50 GL/a by mid 2011, and 100 GL/a by the end of 2012.	2009	2012	SA Water	
7. Additional water sources including desalinated seawater will supplement the Eyre Peninsula water resources, subject to site and environmental investigations.	2009	2014	SA Water	EPA
8. Complete the investigation for the design of, and need for, interconnection works between Adelaide's southern and northern water supply systems.	2009	2012	SA Water	
9. By 2010, finalise a statewide desalination policy to guide future desalination plant proposals, including the identification of additional suitable sites in case they are needed in the future.	Underway	2010	SA Water	EPA DWLBC OWS SA Health

Table 12
Summary of Actions (continued)

Action	Start Date	Completion Date	Lead Agency	Partners
10. Investigate the viability of constructing groundwater desalination plants for regional townships where water quality (i.e. salinity) has been identified as an issue. This will enable improvements to these water supplies by 2025 at the latest.	Underway	2025	SA Water	SA Health OWS
Stormwater Recycling				
11. Complete existing committed stormwater projects, including Cheltenham Park, to provide an additional harvesting capacity of almost 12 GL/a by 2013.	2009	2013	Project proponents: LMC AMLR NRM Board DEH SA Water	Local Government Developers OWS SMA Adelaide Airport Limited
12. Update, by 2010, State water recycling guidelines to reflect the *Australian Guidelines for Water Recycling*, and include stormwater.	2009	2010	Department of Health	EPA SA Water DWLBC PIRSA OWS
13. Subject to Commonwealth assistance and in partnership with local government, stormwater harvesting and recycling will be underway, including: • in the western metropolitan area including Cheltenham Park, Riverside Golf Club, Old Port Road and Adelaide Airport • in the southern metropolitan area, building on the first stage of Water Proofing the South • in Playford and Salisbury, creating further capacity in the northern area, building on Waterproofing Northern Adelaide • at the Adelaide Botanic Gardens, and • at Barker Inlet.	2009	2013	OWS	SA Water DEH Local Government AMLR NRM Board Commonwealth Government
14. Work with local government to update the State-Local Government Stormwater Management Agreement. Clarify the roles of State agencies and local government; reinforce the importance of collaboration; and strengthen governance arrangements.	2009	2011	OWS	DP&LG LGA SMA
15. Work with local government, the Stormwater Management Authority and other stakeholders (including the Commonwealth Government and private enterprise) to identify and develop new stormwater recycling projects in the Adelaide region, in line with the findings of the *Urban Stormwater Harvesting Options Study*.	2009	Ongoing	OWS	SMA Local Government SA Water LMC Private sector NRM Boards Commonwealth Government

Table 12
Summary of Actions (continued)

Action	Start Date	Completion Date	Lead Agency	Partners
16. Develop a master plan for effectively managing stormwater in Adelaide. Include interim milestones and water quality targets to support recommendations in the *Adelaide Coastal Waters Study Final Report*, to provide up to 60 GL/a of recycled stormwater, in Greater Adelaide, by 2050.	2010	2012	Office for Water Security SMA	Local Government SA Water LMC NRM Boards
17. As part of regional water demand and supply planning, develop and implement plans to provide up to 15 GL/a of stormwater harvesting potential in South Australia's regional areas, by 2050.	Underway	2050	OWS	SA Water, DWLBC NRM Boards Local Government
Wastewater Recycling				
18. Develop State guidelines for greywater recycling, consistent with *Australian Guidelines for Water Recycling*, by 2010.	2009	2010	Department of Health	EPA SA Water
19. Develop a master plan for effectively managing wastewater in Adelaide, in concert with the stormwater recycling master plan, to ensure optimum use of both water sources.	2012	2014	SA Water	Local Government OWS NRM Board SMA DP&LG
20. Encourage decentralised wastewater recycling schemes in new developments, in partnership with the implementation of the Plan for Greater Adelaide.	2011	Ongoing	DP&LG	SA Water Local Government OWS
21. Expand recycling of rural community wastewater management schemes (council operated) to 12 GL/a by 2050.	2010	2050	DP&LG	Local Government OWS
22. Complete wastewater recycling projects, including Glenelg to Parklands (open space irrigation), Blakeview (housing development), Southern Urban Recycling Project (housing development), by 2013.	2009	2013	SA Water	SA Health EPA LMC Local Government Private sector
Using and Saving Water				
23. Enhance the H_2OME rebate scheme in September 2009, by: • including a new $150 rebate for the purchase of a hot water recirculator • modifying the washing machine rebates to apply to those with a minimum of 4½ stars • an increase in the garden goods rebate to $100 on a $250 basket of goods, which will now include rainwater diverters • a new $200 rebate for the purchase of approved pool covers and cover rollers for existing household swimming pools.	2009	2011	SA Water	OWS

Table 12
Summary of Actions (continued)

Action	Start Date	Completion Date	Lead Agency	Partners
24. Support the expansion of the Water Efficiency Labelling and Standards (WELS) scheme to include additional products, and minimum performance standards for existing products.	2009	Ongoing	OWS SA Water	Commonwealth Government
25. Implement the best regulatory approach to mandate swimming pool covers by 2012.	2011	2012	DP&LG	SA Water OWS
26. Apply permanent water conservation measures to private bores in urban areas from 2010.	2010	Ongoing	DWLBC	OWS NRM Boards
27. Develop the Urban Landscape Program to provide South Australians with the knowledge, tools and incentives to develop appropriate water-wise gardens and landscapes by the end of 2011.	2010	Ongoing	SA Water	Gardening Industry OWS
28. By 2010, require SA Water customers using more than 25 ML a year to complete a water efficiency plan.	2010	Ongoing	SA Water	Private Industry
29. Include leak detection in the water auditing process of the Business Water Saver Program.	2009	2011	SA Water	
30. Work with industry to encourage the uptake of stormwater and recycled water for primary production in lieu of mains water.	2009	Ongoing	PIRSA	SA Water Local Government
31. Irrigation meters will be installed in the Mount Lofty Ranges Prescribed Areas by 2014, once water users are licensed.	2010	2014	DWLBC	NRM Boards
32. Develop a new water information website, with clear and readily accessible information on South Australia's water resources, and information to help South Australians improve water-use practices by the end of 2009.	2009	2009	OWS	DPC SA Water
33. Develop an awards program, including a Premier's award, to recognise the achievements of communities, individuals, schools, businesses, industry and government that are contributing to our future water security by the end of 2011.	2010	Ongoing	OWS	Industry bodies DPC
34. Work with the South Australian Multicultural and Ethnic Affairs Commission to develop targeted water education programs with the various ethnic communities of South Australia.	2010	Ongoing	OWS	SA Multicultural & Ethnic Affairs
35. Maintain permanent water conservation measures when new sources of water come on line and water restrictions can be lifted.	By end 2012	Ongoing	SA Water	
36. Extend delivery of irrigation efficiency programs, such as the Irrigated Public Open Space program, to all local councils and schools. Incorporate the identification of opportunities to substitute mains water used for community purposes with fit for purpose water (e.g. recycled water, rainwater and stormwater).	2009	2011	SA Water	DECS Local Government

Table 12
Summary of Actions (continued)

Action	Start Date	Completion Date	Lead Agency	Partners
37. Implement a retro-fitting program to improve the water efficiency of publicly-owned buildings, and encourage similar water efficiency measures in buildings leased by the Government, and in other private commercial buildings where appropriate.	2009	2013	State agencies	Private commercial building owners DP&LG
38. Continue SA Water's program of leak detection and repair in its metropolitan and major country town networks and report annually on progress.	2009	Ongoing	SA Water	OWS
39. By 2010, expand water education to raise awareness among South Australians of key water issues through a **Water for Good** education campaign.	2009	Ongoing	OWS	SA Water DPC
40. Provide SA Water customers with more information on their water bills, including comparisons with previous use and use in similar homes.	2009	2010	SA Water	OWS
41. By 2013, develop further curriculum resources to help lower and middle school students learn more about water resources, the water cycle, and what can be done to reduce water use.	2009	2013	OWS	SA Water DWLBC DECS
Rain, Rivers, Reservoirs and Aquifers				
42. Explore the economic and environmental feasibility of using saline water produced in salinity management schemes.	Underway	2015	DWLBC	SAMDB NRM Board
43. Commission, where required, regional scale studies on the impacts of climate change on water resources.	2009	2014	OWS	BOM CSIRO DPC SA Water
44. Adopt a two staged approach to water allocation planning, with an Interim Water Allocation Plan followed by a Comprehensive Water Allocation Plan for all newly prescribed areas.	2010	2012	DWLBC	NRM Boards
45. Provide funding of $8.6 million over two years, (2009/10 and 2010/11), to strategically review and, where required, expand or upgrade the water resources monitoring network.	2009	2012	DWLBC	SA Water NRM Boards
46. Increase regularity of statewide data collation, assessment and reporting, where required.			DWLBC	SA Water EPA NRM Boards
47. Implement a statewide policy framework for managing the water resource impacts of plantation forests, and amend the *Natural Resources Management Act 2004* to allow forest water licensing, where appropriate, consistent with the statewide policy framework.	2009	Ongoing	DWLBC	NRM Boards PIRSA

Table 12
Summary of Actions (continued)

Action	Start Date	Completion Date	Lead Agency	Partners
48. Require mining ventures to provide their own water supplies within the sustainable framework of natural resources management planning, and regional water demand and supply plans.	Underway	Ongoing	PIRSA	SA Water DWLBC
49. Develop water quality improvement plans for the Mount Lofty Ranges (MLR) Watershed by 2011 and other critical water catchments across the State by 2017.	2009	2017	EPA	DWLBC NRM Boards SA Water
50. Establish planning policies, based on the water quality risk hierarchy associated with the MLR Watershed Priority Areas, to ensure that new developments have a beneficial, or at least neutral, impact on water quality in the Watershed.	2010	2012	DP&LG	EPA Local Government
51. Undertake a comprehensive review of current management and protection of the MLR Watershed with a view to developing an agreed vision, targets and responsibilities for its future management by the end of 2010.	2009	2010	OWS	EPA NRM Boards DWLBC SA Water
52. Require relevant agencies to report annually on how they are meeting the MLR Watershed targets.	2011	Ongoing	OWS	DWLBC EPA
53. Work with the Murray-Darling Basin Authority and other Basin jurisdictions to ensure a healthy, working River Murray that will continue to provide critical human water needs for Greater Adelaide and regional South Australia, irrigation requirements and water for the environment. Specifically, by seeking: • a Basin Plan that incorporates appropriate 'end-of system' objectives, targets and actions by returning the River Murray to sustainable levels of extraction • a Basin Plan that establishes a permanent system of environmental flows for the River Murray and Lower Lakes, including management of unregulated flows and salinity • improved arrangements for risk management, storage, delivery of and accounting for water • reviewing and improving river operations, particularly river operating strategies and rules, to ensure more effective, efficient and transparent distribution of South Australia's water entitlement.	2009	Ongoing	DWLBC	MDBA Other Basin States OWS
54. Complete, on time, the elements of the *Murray Futures* program designed to sustain, support and reinvigorate communities and industries within the Murray-Darling Basin in South Australia.	Underway	2018	OWS	DEH SA Water DWLBC PIRSA
55. Undertake real-time management of environmental issues and potential risks affecting the Lower Lakes.	Underway	Ongoing	DEH	DWLBC SA Water

Table 12
Summary of Actions (continued)

Action	Start Date	Completion Date	Lead Agency	Partners
56. Maintain a positive balance on the Murray-Darling Basin Salinity Register, and continue to implement strategies and actions to ensure the real time management of salinity in the lower reaches of the River Murray so that water quality remains at levels suitable for human consumption.	Underway	Ongoing	DWLBC	PIRSA SA Water MDBA
57. As a last resort, build a temporary weir at Pomanda Island to protect the water supply to the 1.2 million people currently receiving it from the River Murray below Lock 1. The temporary weir would only be constructed if inflows remain at critically low levels and agreed triggers for acidification or salinity were activated and could not otherwise be prevented.	2009 (if required & approved)	2010	SA Water	DWLBC OWS
58. Complete water allocation plans and regulatory review of water allocation plans for key areas, in the Mount Lofty Ranges, the Murray-Darling Basin, the South East and Central Adelaide.	Underway	2010	NRM Boards	DWLBC
59. Implement SA Water's fire recovery strategy for all reservoirs in the Mount Lofty Ranges catchments.	Underway	Ongoing	SA Water	
60. Bring additional water resources into formal management through prescription and water allocation planning, as necessary.	2010	Ongoing	DWLBC	NRM Boards
61. Continue programs to unbundle water rights across South Australia and remove barriers to trading water entitlements.	Underway	2014	DWLBC	NRM Boards
62. Work with Bureau of Meteorology to develop a Strategic Water Information Plan.	Underway	2012	DWLBC	BOM SA Water
63. The Environment Protection Authority will develop environmental values for priority water bodies across the State by 2014.	Underway	2014	EPA	NRM Boards
Planning				
64. Ensure regional water demand and supply plans are in place for all natural resources management regions throughout the State – in consultation with regional communities, building on existing plans, and incorporating local knowledge by 2014.	2009	2014	OWS	NRM Boards SA Water Local Government DP&LG Regional Economic Development Boards
65. Commission or contribute towards the development of a regional demand and supply forecasting model.	2009	2010	DWLBC	OWS SA Water BOM
66. Develop and implement a strategy to improve the quality of water provided to remote communities	2009	2014	OWS	SA Water DWLBC DPC

Table 12
Summary of Actions (continued)

Action	Start Date	Completion Date	Lead Agency	Partners
67. By 2013, develop and implement the best regulatory approach for South Australia to mandate water-sensitive urban design, dovetailing with the Plan for Greater Adelaide.	2012	Ongoing	DP&LG	SA Water DWLBC OWS
68. Introduce targets for water-sensitive urban design by 2010.	2009	2010	DP&LG	SA Water SA Health OWS
Fostering Innovation and Efficiency				
69. Work with research institutions and industry to enhance co-ordination of the research effort and improve collaboration to identify priorities and ensure timely delivery.	Underway	Ongoing	DFEEST	PIRSA DTED DWLBC SA Water OWS NRM Research Alliance
Pricing and Market Instruments				
70. Appoint ESCOSA as the independent economic regulator for monopoly suppliers of urban and regional water and wastewater services in South Australia. This will apply to SA Water's potable water and wastewater services in the first instance.	2009	2010	DTF OWS	
71. Initiate a transition to a single potable water use price for SA Water's non-residential customers.	2011	2016	ESCOSA	DTF SA Water
72. In consultation with customers, and over a period of five years, transition SA Water customers to water supply charges based on the number and size of the customers' meters while managing any unreasonable impacts for individual customers.	2011	2016	ESCOSA	DTF SA Water
73. Request the independent regulator, in the medium term, to examine price structures that may benefit economic efficiency and water security.	2015	2020	DTF	
74. Develop State-based recycled water pricing principles to ensure competitive pricing of these emerging water sources.	2010	2011	OWS	DTF SA Water SMA
75. Set water and wastewater prices to encourage economically efficient use and continue to support low-income households through transparent, targeted concessions schemes.	2010	Ongoing	DTF	ESCOSA DFC
76. Require the independent regulator to monitor and report on the effect of statewide pricing.	2011	Ongoing	ESCOSA	DTF OWS

Table 12
Summary of Actions (continued)

Action	Start Date	Completion Date	Lead Agency	Partners
77. Maintain government ownership of SA Water and develop a State-based third-party access regime that allows water and wastewater suppliers to access monopoly water and wastewater infrastructure. Any such access will require licensing to ensure protection of public interest, public health and the environment.	2010	2015	DTF OWS	ESCOSA SA Water Private Sector
78. Explore the merits of innovative and competitive arrangements, in the medium term, which could allow for competition in the supply of bulk water, recycled water and retail services to customers, while retaining government ownership of the public water supply infrastructure.			DTF OWS	
79. Continue to move potable water use prices for SA Water customers towards cost-reflective prices.	Underway	Ongoing	DTF	OWS ESCOSA
80. Bill SA Water customers for consumption on a quarterly basis to provide more timely information regarding water use.	2009	Ongoing	SA Water	
81. Identify the costs of providing water planning and management in South Australia, introduce a water planning and management cost-recovery framework, and set charges in accordance with it from 2011-12.	Underway	2012	DWLBC	
82. Continue to support regional communities using SA Water's networks through the application of statewide pricing and report costs transparently in the State Budget.	Underway	Ongoing	DTF	OWS SA Water
Legislative and Regulatory Changes				
83. Release a discussion paper for consultation during 2009 outlining proposed new legislation: introduce new legislation in 2010.	2009	2010	OWS	SA Water DWLBC
84. Work with the LGA to review and update the governance of the Stormwater Management Authority to ensure that appropriate emphasis is given to stormwater harvesting and reuse.	2009	2009	OWS	LGA DP&LG
85. Introduce legislative amendments to remove any prohibition on SA Water proactively taking a role in stormwater reuse.	2010	2010	OWS	SA Water LGA SMA
86. Give explicit statutory recognition to an Environmental Water Reserve through the *Natural Resources Management Act 2004*.	2010	2010	OWS	DWLBC NRM Boards
87. Provide definitions for the various types of wastewater, and certainty as to ownership.	2010	2010	OWS	SA Water

Action	Start Date	Completion Date	Lead Agency	Partners
88. Ensure excellent service and fair treatment through independent and transparent customer consultation, complaints processes and the establishment of a Customer Advocacy and Advisory Council.	2010	2010	OWS	SA Water ESCOSA
89. Give statutory force to water demand and supply plans and outline how these will be developed, implemented, reviewed and maintained.	2010	2010	OWS	DWLBC SA Water
90. Give explicit statutory recognition to the concept of managing the water cycle and, of water security	2010	2010	OWS	DWLBC SA Water
91. Strengthen existing assurance of water planning and service delivery	2010	2010	OWS	DWLBC SA Water
92. Develop new legislation to ensure best practice water quality standards are maintained as water supply becomes increasingly diversified.	2010	2010	SA Health	SA Water EPA OWS
93. Provide for independent technical regulation of plumbing standards and practices.	2010	2010	OWS	DTE1 SA Water
94. Continue to support world-leading research to assess the potential for treating stormwater to a very high quality and monitor future scientific developments and technological innovations. However, we do not intend to feed recycled water directly into the mains water system.	Underway	Ongoing	OWS	SA Health DFEEST

Part 7

Staying on track – implementation and monitoring

Appendices

Appendix 1

Definition of Greater Adelaide

Comparison of various definitions of "Adelaide"

The water consumption for Adelaide has been either reported or described in water planning studies based on a number of different definitions of the area served. These include:

- "Metropolitan Adelaide" for which SA Water reports consumption
- The Metropolitan Adelaide Water Supply System (MAWSS) as defined operationally by SA Water
- The Adelaide area defined in the "Water Proofing Adelaide" study.
- The "Greater Adelaide" area that is the subject of the 30 year planning study
- The Adelaide Statistical Division
- The Adelaide and Mount Lofty Ranges Natural Resources Management Region.

The following inner metropolitan councils are common to all of these areas:

Gawler	West Torrens
Playford	Adelaide
Tea Tree Gully	Norwood Payneham St Peters
Salisbury	Burnside
Port Adelaide Enfield	Unley
Campbelltown	Mitcham
Charles Sturt	Holdfast Bay
Walkerville	Marion
Prospect	Onkaparinga

Differences between the various definitions of "Adelaide" are as shown in the table:

Additional Areas Included	Metro Adelaide supply area	ASD	WPA	NRM	MAWSS	Greater Adelaide
Adelaide Hills Council	small part	✓	✓	✓	✓	✓
Mount Barker Council			part	part	✓	✓
Victor Harbor Council				✓		✓
Yankalilla Council				✓		✓
Alexandrina Council				Goolwa & Pt Elliot	Strathalbyn & Clayton	✓
Murray Bridge Council					✓	✓
Barossa Valley Council			✓	most		✓
Mid-Murray Council					part	part
Light Council			✓	part		✓
Mallala Council				part		✓
Kangaroo Island						✓

Differences between water demands for the various regions are illustrated in the following table:

Additional Areas Included	Metro Adelaide supply area	ASD	WPA	NRM	MAWSS	Greater Adelaide
2000/01	194	199	212	215	213	224
2002/03	178	184	197	201	199	210
2004/05	166	171	183	186	185	195
2007/08	139	143	153	156	155	163

The Metro Supply Area and the MAWSS consumptions are those recorded by SA Water. The others are estimated based on a combination of customer meter data and master meter data.

A "rule of thumb" is suggested based on these numbers for comparing demand estimates in different definitions of "Adelaide":

- Metro Adelaide = 90.2% x MAWSS
- Adelaide Statistical Division = 92.8% x MAWSS
- The Water Proofing Adelaide study area = 99% x MAWSS
- NRM area = 101% x MAWSS
- Greater Adelaide Plan area = 105.3% x MAWSS

Other key relationships are:

- "Metro Adelaide" = 91.0% x WPA area
- Greater Adelaide Plan area = 106.3% x WPA area

It should be noted that these relationships are proposed as a means of interpreting existing study outputs, for comparison purposes. The ratios will vary as development occurs in different areas, particularly within the outer metro part of Greater Adelaide.

Description of definitions of "Adelaide"

SA Water's "Metropolitan Adelaide" demand area

Based on the area served by the six metropolitan water treatment plants (Barossa, Little Para, Anstey Hill, Hope Valley, Happy Valley and Myponga) *that are within the metropolitan councils described above*. (Supplies from these plants that are outside the above council areas are excluded).

Includes also a very small part of the Adelaide Hills Council area adjacent to Rostrevor.

SA Water's Metropolitan Adelaide Water Supply System (MAWSS) (as defined for operational purposes)

MAWSS describes the water supply system that supplies Metropolitan Adelaide, but the consumptions include all the water supplied by that system. In addition to the "metropolitan Adelaide" area it includes:

- Adelaide Hills and Mount Barker
- Murray Bridge Council (including Mannum)
- Alexandrina, Victor Harbor and Yankalilla Council areas
- Parts of the Mallala, Light and Barossa council areas (supplied from the Barossa Reservoir), but not including the Barossa Valley.

The Adelaide area defined in the "Water Proofing Adelaide" study

Water Proofing Adelaide was based around the four (then) Catchment Water Management Board (CWMB) areas in metropolitan Adelaide, with some additional areas that were important in respect of future urban demands. It included:

- Northern Adelaide & Barossa CWMB
- Torrens CWMB
- Patawalonga CWMB
- Onkaparinga CWMB
- All of the Barossa and Light Council areas
- Part of Mt Barker Council (urban portion)
- Myponga Reservoir

It does not include Murray Bridge, Mannum or the Fleurieu Peninsula.

"Greater Adelaide"

Greater Adelaide is most similar to the MAWSS area, but includes all of the Barossa, Mallala and Light Councils.

Adelaide Statistical Division

The Adelaide Statistical Division is similar to the metro Adelaide water consumption area, with the addition of the Adelaide Hills Council.

Appendix 2

List of water legislation

List of South Australian legislation relevant to this plan

Environment Protection Act 1993

Essential Services Commission Act 2002

Food Act 2001

Irrigation Act 2009

Local Government (Stormwater Management) Amendment Act 2007

Metropolitan Drainage Act 1935

Metropolitan Drainage Works (Investigation) Act 1957

Murray-Darling Basin Act 2008

Natural Resources Management Act 2004

Public and Environmental Health Act 1987

Renmark Irrigation Trust Act 2009

River Murray Act 2003

Sewerage Act 1929

South Australian Water Corporation Act 1994

South-Western Suburbs Drainage Act 1959

Water Conservation Act 1936

Waterworks Act 1932

Appendix 3

Example: Victorian Water Industry Regulatory Order (WIRO)

Water Industry Act 1994

Water Industry Regulatory Order 2003

Amended as at 25 October 2005.

The Governor in Council makes the following Order:

General

1. Title

This **Order** is called the Water Industry Regulatory Order 2003.

2. Commencement

This **Order** comes into operation on 1 January 2004 and remains in force until it is revoked.

3. Authorising Provision

This **Order** is made under section 4D(1)(a) of the Act.

4. Purpose

The purpose of this Order is to provide a framework for economic regulation by the **Commission** for services provided by the regulated water industry by:

(a) specifying which goods and services are to be prescribed goods and services in respect of which the **Commission** has the power to regulate prices;

(b) declaring which goods and services are to be declared goods and services in respect of which the **Commission** has the power to regulate standards and conditions of service and supply;

(c) specifying the approach to be adopted by the **Commission** in regulating the price of prescribed goods and services;

(d) specifying particular matters to which the **Commission** must have regard in exercising its powers and functions under this **Order**;

(e) conferring on the **Commission** certain functions in relation to monitoring, performance reporting and auditing; and

(f) conferring on the **Commission** certain functions in relation to dispute resolution.

5. Definitions

In this **Order**, unless the contrary intention appears the words and phrases have the meanings given to them in Schedule 1.

Coverage

6. Prescribed Services and Declared Services

(a) The following services supplied by or within the regulated water industry are declared services in respect of which the Commission has the power to regulate standards and conditions of service and supply:

(i) **retail water services**;

(ii) **retail recycled water services**;

(iii) **retail sewerage services**;

(iv) **storage operator and bulk water services**;

(v) **bulk sewerage services**;

(vi) **bulk recycled water services**;

(vii) **metropolitan drainage services**;

(viii) **irrigation drainage services**;

(ix) **connection services**;

(x) services to which **developer charges** apply; and

(xi) **diversion services**.

(b) The following services supplied by or within the **regulated water industry**, with the exception of those provided by the First Mildura Irrigation Trust, Gippsland and Southern Rural Water Authority, Goulburn-Murray Rural Water Authority, Grampians Wimmera Mallee Water Authority and Lower Murray Urban and Rural Water Authority, are specified as prescribed services in respect of which the **Commission** has the power to regulate prices:

(i) **retail water services**;

(ii) **retail recycled water services**;

(iii) **retail sewerage services**;

(iv) **storage operator and bulk water services**;

(v) **bulk sewerage services**;

(vi) **bulk recycled water services**;

(vii) **metropolitan drainage services**;

(viii) **irrigation drainage services**;

(ix) **connection services**;

(x) services to which **developer charges** apply; and

(xi) **diversion services**.

(c) The following services supplied by the First Mildura Irrigation Trust, Gippsland and Southern Rural Water Authority, Goulburn-Murray Rural Water Authority, Grampians Wimmera Mallee Water Authority and Lower Murray Urban and Rural Water Authority are specified as prescribed services after 1 July 2006 in respect of which the **Commission** has the power to regulate prices:

(i) **retail water services**;

(ii) **retail recycled water services**;

(iii) **retail sewerage services**;

(iv) **storage operator and bulk water services**;

(v) **bulk sewerage services**;

(vi) **bulk recycled water services**;

(vii) **metropolitan drainage services**;

(viii) **irrigation drainage services**;

(ix) **connection services**;

(x) services to which **developer charges** apply; and

(xi) **diversion services**.

(d) Nothing in this **Order** is to be taken as precluding services that come within one of the categories of service identified in paragraphs (a), (b) and (c) being regulated, whether as to price, standards and conditions of service and supply, in a different manner from either other services that come within that same category or other services that come within a different category.

Regulatory Period

7. Regulatory Period

(a) The first **regulatory period** shall be:

(i) for the First Mildura Irrigation Trust, Gippsland and Southern Rural Water Authority, Goulburn-Murray Rural Water Authority, Grampians Wimmera Mallee Water Authority and Lower Murray Urban and Rural Water Authority, the 2 year period commencing on 1 July 2006; and

(ii) for all other regulated authorities, the 3 year period commencing on 1 July 2005.

(b) Except in the case of the **first regulatory** period, the **Commission** must set the term of each **regulatory period**.

Regulatory Approach

8. Decision in relation to prices

Before the commencement of a **regulatory period**, the **Commission** must:

(a) approve all of the prices which a **regulated entity** may charge for prescribed services, or the manner in which such prices are to be calculated or otherwise determined, as set out in the **regulated entity's Water Plan**, until the commencement of the next **regulatory period**; or

(b) specify the prices which a **regulated entity** may charge for **prescribed services**, or the manner in which such prices are to be calculated or otherwise determined, until the commencement of the next **regulatory period**.

For the avoidance of doubt:

(c) a decision of the **Commission** under paragraph (a) or (b) is a determination for the purposes of the **ESC Act**.

9. Approval of prices

The **Commission** must give the approval referred to in clause 8(a) if it is satisfied that the prices which the **regulated entity** may charge for **prescribed services** or the manner in which they are to be calculated or otherwise determined (as set out in the **Water Plan**):

(a) were developed in accordance with the **Procedural Requirements**; and

(b) comply with the relevant **Regulatory Principles**.

10. Specifying prices

The **Commission** may only specify prices, or the manner in which such prices are to be calculated or otherwise determined, under clause 8(b) if a **regulated entity**:

(a) fails to deliver to the **Commission** a **Water Plan** within the time specified for such delivery in the **Statements of Obligations** that has been issued to that **regulated entity**; or

(b) after considering the **Water Plan** and any variations to it made after the issue of the Commission's draft decision in relation to the **Water Plan**, the **Commission** is not satisfied that the prices which the regulated entity may charge for prescribed services or the manner in which they are to be calculated or otherwise determined:

(i) were developed in accordance with the **Procedural Requirements**; and

(ii) comply with the relevant **Regulatory Principles**.

11. Draft decision

Before making a decision under clause 8, the **Commission** must issue a draft decision which either:

(a) proposes to give the approval referred to in clause 8(a); or

(b) proposes to refuse to give the approval referred to in clause 8(a) and specifies the reasons for the **Commission's** proposed refusal (which may include suggested amendments to, or action to be taken in respect of, the **Water Plan** that, if adopted or taken, may result in the **Commission** giving that approval) and the date by which a **regulated entity** must resubmit a revised **Water Plan** or undertake such action as to ensure compliance.

12. Information

In order to be satisfied that prices, or the manner in which such prices are to be calculated or otherwise determined:

(a) were developed in accordance with the **Procedural Requirements**; and

(b) comply with the relevant **Regulatory Principles**, the **Commission** may require the regulated entity to provide additional information in support of its **Water Plan**.

Procedural Requirements and Regulatory Principles

13. Procedural Requirements

In order to be satisfied that prices, or the manner in which such prices are to be calculated or otherwise determined, have been developed in accordance with the **Procedural Requirements**, as required by this **Order**, the Commission must be satisfied that the regulated entity has observed the procedural requirements as set out in the **Statement of Obligations**.

14. Regulatory Principles

(1) In order to be satisfied that prices, or the manner in which such prices are to be calculated or otherwise determined, comply with the **Regulatory Principles**, as required by this **Order**, the Commission must be satisfied that:

(a) the prices contained in the Water Plan as those which the regulated entity proposes it be permitted to charge for prescribed services over the term of the Water Plan, or the manner in which the Water Plan proposes that such prices are to be calculated or otherwise determined, must be such as to:

(i) provide for a sustainable revenue stream to the regulated entity that nonetheless does not reflect monopoly rents and or inefficient expenditure by the regulated entity;

(ii) allow the regulated entity to recover its operational, maintenance and administrative costs;

(iii) allow the regulated entity to recover its expenditure on renewing and rehabilitating existing assets;

(iv) allow the regulated entity to recover:

(A) a rate of return on assets as at 1 July 2004 that are valued in a manner determined by, or at an amount otherwise specified by, the Minister at any time before 1 July 2004;

(B) all costs associated with existing debt incurred to finance expenditure prior to 1 July 2006, in a manner determined by the Minister at any time before 1 July 2006;

(v) allow the regulated entity to recover a rate of return on investments made after 1 July 2004 to augment existing assets or construct new assets;

(vi) provide incentives for the sustainable use of Victoria's water resources by providing appropriate signals to water users about:

(A) the costs of providing services, including costs associated with future supplies and periods of peak demands and or restricted supply; and

(B) choices regarding alternative supplies for different purposes;

(vii) take into account the interests of customers of the regulated entity, including low income and vulnerable customers;

(viii) provide the regulated entity with incentives to pursue efficiency improvements and to promote the sustainable use of Victoria's water resources; and

(ix) enable customers or potential customers of the regulated entity to readily understand the prices charged by the regulated entity for prescribed services, or the manner in which such prices are to be calculated or otherwise determined;

(b) the expenditure forecasts contained in the Water Plan must reflect the efficient delivery of the proposed outcomes contained in the Water Plan and take into account a planning horizon that extends beyond the term of the Water Plan.

(2) The **Regulatory Principles** in clause 14(1) do not apply to the regulated entities referred to in clause 7(a)(1), if clause 14A applies.''.

14A. Rural Sector Regulatory Principles for the First Regulatory Period

For the **first regulatory** period for the entities referred to in clause 7(a)(i), in order to be satisfied that the manner in which prices are to be calculated or otherwise determined complies with the **Regulatory Principles** in paragraphs (a) and (b) of this clause as required by this **Order**, the Commission must be satisfied that:

(a) the prices contained in the **Water Plan** as those which these authorities propose to be permitted to charge for **prescribed services** over the term of the **Water Plan**, or the manner in which the **Water Plan** proposes that such prices are to be calculated or otherwise determined, must be such as to:

(i) provide for a sustainable revenue stream to the regulated entity that nonetheless does not reflect monopoly rents and or inefficient expenditure by the authority;

(ii) allow the regulated entity to recover its operational, maintenance and administrative costs;

(iii) allow the regulated entity to recover its expenditure on renewing and rehabilitating existing assets, either by classifying the expenditure as maintenance, recovering a renewals annuity, or borrowing and recovering the cost over time;

(iv) allow the regulated entity to recover:

(A) a rate of return on assets as at 1 July 2004 that are valued in a manner determined by, or at an amount otherwise specified by the Minister at any time before 1 July 2004; or

(B) all costs associated with existing debt incurred to finance recent expenditure prior to 1 July 2006, in a manner determined by the Minister at any time before 1 July 2006;

(v) allow the regulated entity to recover a rate of return on investments made after 1 July 2004 to augment existing assets or construct new assets;

(vi) provide incentives for the sustainable use of Victoria's water resources by providing appropriate signals to urban water users about:

(A) the costs of providing services, including costs associated with future supplies and periods of peak demands and or restricted supply; and

(B) choices regarding alternative supplies for different purposes;

(vii) take into account the interests of customers of the regulated entity, including low income and vulnerable urban water users;

(viii) provide the regulated entity with incentives to pursue efficiency improvements; and

(ix) enable customers or potential customers of the regulated entity to readily understand the prices charged by the regulated entity for **prescribed services**, or the manner in which such prices are to be calculated or otherwise determined;

(b) the expenditure forecasts contained in the **Water Plan** must reflect the efficient delivery of the proposed outcomes contained in the **Water Plan** and take into account a planning horizon that extends beyond the term of the **Water Plan**.

Regulation of Service Quality

15. Specifying standards and conditions

The **Commission** may specify standards and conditions of services and supply with which a **regulated entity** is obliged to comply in connection with the provision by it of **declared services**:

(a) by approving standards and conditions of services and supply which a regulated entity has included in its **Water Plan**; or

(b) by specifying standards and conditions of services and supply in a **Code** issued under section 4F of the Act; or

(c) by any combination of the means specified in paragraphs (a) and (b).

Monitoring, Performance Reporting and Auditing

16. Performance Monitoring and Reporting

The **Commission** has the function of monitoring and reporting publicly on the performance of the **regulated water industry**.

17. Auditing

The **Commission** has the function of carrying out audits in relation to:

(a) the compliance of **regulated entities** with the standards and conditions of service and supply specified by the **Commission** in any Code or set out in their **Water Plans**, and the systems and processes established by the **regulated entity** to ensure such compliance;

(b) the reliability and quality of information reported by **regulated entities** to the **Commission** and the conformity of that information with any specification issued by the **Commission**; and

(c) the compliance of **regulated entities** with obligations imposed in any **Statement of Obligations** issued to them in respect of the management of their assets.

In the case of any such audits:

(d) the Commission may decide the scope and frequency of such audits provided that such audits are not conducted more frequently than once in any given **financial year**;

(e) conducted pursuant to paragraph (c), the **Commission** must include in that audit any matters requested by the **Minister**.

18. Audits requested by Minister

The **Minister** may request the **Commission** to audit the compliance of a **regulated entity** with such obligations as are identified by the **Minister** and as are imposed on that **regulated entity** under the **Statement of Obligations** that is issued to it, in which case the **Commission** must carry out that audit in accordance with that request.

19. Publication of audit results

The **Commission** must publicly report on the results of all audits conducted under clause 17 or 18.

Dispute Resolution

20. Disputes between regulated entities

In such circumstances as the **Commission** determines, the **Commission** has the function of facilitating the resolution of a dispute in relation to prices and standards and conditions of service and supply provided for in an agreement between two **regulated entities** to supply **storage operator and bulk water services, bulk sewerage services** and bulk **recycled water services**. The **Commission** may carry out this function by requiring mediation or arbitration or by any other means the **Commission** considers appropriate.

Dated: 16 December 2003

Responsible Minister:

John Thwaites

Minister for Water

Clerk of the Executive Council

Schedule 1

Definitions

In this **Order**:

"**Act**" means the Water Industry Act 1994;

"**business day**" means a day on which banks are open for general banking business in Melbourne, not being a Saturday or a Sunday;

"**bulk recycled water service**" means a service provided by **Melbourne Water** in connection with the provision of a supply of recycled water;

"**bulk sewerage service**" means a service provided by **Melbourne Water** in connection with the conveyance, treatment and disposal of wastewater for a **regulated entity**;

"**Code**" means a code under section 4F of the **Act**;

"**Commission**" means the Essential Services Commission established under the **ESC Act**;

"**connection service**" means the connection of a serviced property to a water supply system or sewerage system;

"**declared services**" means the services described in clause 6 of this **Order**;

"**developer charges**" means:

(a) contributions to the cost of works imposed under sections 27, 28 and 29 of the **Act**;

(b) contributions to the costs of works imposed under Division 6 of Part 13 of the **Water Act 1989**; and

(c) contributions to the cost of drainage works imposed under section 269A of the **Melbourne and Metropolitan Board of Works Act 1958**;

"**diversion service**" means a service provided by a **regulated entity** in connection with the management, extraction or use of groundwater or surface water;

"**ESC Act**" means the Essential Services Commission Act 2001;

"**financial year**" means a year ending 30 June;

"**irrigation drainage services**" means a service provided by a Rural Water Authority in connection with the removal and disposal of run-off from irrigation;

"**Melbourne Water**" means the Corporation as that term is defined in Melbourne Water Corporation Act 1992;

"**metropolitan drainage service**" means a service provided by **Melbourne Water** in connection with the performance of its functions under Part X of the Melbourne and Metropolitan Board of Works Act 1958;

"**metropolitan retail water company**" means:

(a) City West Water Limited (ACN 066 902 467);

(b) South East Water Limited (ACN 066 902 547); or

(c) Yarra Valley Water Limited (ACN 066 902 501);

"**Minister**" means the Minister administering the Act;

"**Order**" means this Water Industry Regulatory Order 2003;

"**prescribed services**" means the services described in clause 6 of this **Order**;

"**Procedural Requirements**" means the procedures referred to in clause 13 of this **Order**;

"**Regional Urban Water Authority**" has the meaning given in section 4A of the **Act**;

"**regulated entity**" has the meaning given in section 4A of the **Act**;

"**regulatory period**" means a period over which a decision of the Commission under clause 8 of this **Order** is to apply;

"**Regulatory Principles**" means the principles set out in clause 14 and 14A of this **Order**;

"**regulated water industry**" has the meaning given in section 4A of the **Act**;

"**retail recycled water service**" means as service provided by a **regulated entity** in connection with the provision of a supply of recycled water;

"**retail sewerage service**" means a service provided by a **metropolitan retail water company** or by a **Regional Urban Water Authority** in connection with the removal, treatment and disposal of sewage and **trade waste**;

"**retail water service**" means a service provided by a **regulated entity** in connection with the provision of a supply of water to a person other than a **regulated entity**;

"**Rural Water Authority**" has the meaning given in section 4A of the **Act**;

"**Statement of Obligations**" means a Statement of Obligations issued by the **Minister** under section 4I(2) or section 8(1) of the **Act**;

"**storage operator and bulk water service**" means a service provided by a **regulated entity** in connection with the provision of a supply of water to a **regulated entity**;

"**trade waste**" means any waterborne waste (other than sewage) which is suitable, according to the criteria of a **regulated entity**, for discharge into the **regulated entity's** sewerage system;

"**urban water users**" means customers who receive an urban water service from Grampians Wimmera Mallee Water Authority or Lower Murray Urban and Rural Water Authority;

"**Water Plan**" means a water plan that is required to be delivered to the **Commission** by a **regulated entity** under a **Statement of Obligations**.

Glossary

Aquifer – Underground sediments or fractured rock that hold water and allow water to flow through them. Aquifers include confined, unconfined and artesian types.

Aquifer Storage and Recovery –Involves the process of recharging water into an aquifer for the purpose of storage and subsequent withdrawal.

Augmentation – provision of additional water supply, normally achieved through construction of new infrastructure

Biodiversity – A shortening of the term biological diversity, which means the variety of all life forms.

Blackwater – Wastewater containing, or likely to be contaminated by, human waste matter (e.g. toilet wastewater or waters contaminated by toilet wastewater).

Brownfield sites – Development on sites that have previously been used for urban land uses.

Catchment – An area of land that collects rainfall and contributes to surface water (streams, rivers, wetlands) or to groundwater.

Climate change – Variations in historic weather patterns due to increases in the Earth's average temperature resulting from increased greenhouse gases in the atmosphere

Critical human water needs – Minimum amount of water that can reasonably be provided from the Murray-Darling Basin, required to meet core human consumption requirements and non-human consumption where failure to do so would cause prohibitively high costs

Commercial use – Commercial uses can include, but are not limited to, automotive/equipment showrooms, food outlets, restaurants, hotels, garden centres, motels, offices, supermarkets and shops.

Demand management – An approach that is used to intentionally reduce the consumption of water through specific initiatives, normally either to conserve supplies or defer augmentations.

Desalination – The process of removing dissolved salts from seawater (or brackish water) so that it becomes suitable for drinking or other productive uses.

Detention – Short-term storage of runoff. The objective of a detention facility is to regulate the runoff from a given rainfall event to reduce the impact on downstream stormwater systems and improve water quality.

Drinking water (potable water) – Water that is fit for human consumption.

Ecological footprint – Total area of land and/or water required to sustain a given population, organisation or activity.

Ecosystem – A community of plants, animals and microorganisms that are linked by energy and nutrient flows and that interact which each other and with the physical environment.

Effluent – The outflow of wastewater from any water processing system or device.

Environmental flow release – Release from a water storage intended to maintain appropriate environmental conditions in a waterway.

Externalities – When setting price, consideration should be given to the full cost to society of providing the water including the costs or benefits arising from an individual's consumption that affects others, such as social and environmental impacts. These impacts are known as externalities

Greenfield sites – Development on open land (usually greater than 4000 square metres) that has not previously been developed for urban land uses.

Greywater – Household wastewater from the laundry, bathroom and kitchen.

Glossary

Groundwater – Sub-surface water, particularly that which is held in aquifers.

Industrial wastewater – The liquid waste from any industry, business, trade or manufacturing premises, other than domestic sewage, which is disposed of to the sewer. Also known as trade waste

Irrigation – The application of water to cultivated land or open space to promote the growth of vegetation or crops

Natural recharge – The infiltration of water into an aquifer from the surface (rainfall, stream flow, irrigation etc).

Natural resources management – All activities that involve the use, development or protection of natural resources and/or that impact on the state and condition of natural resources, whether positively or negatively.

Prescribed Water Resource – A prescribed water resource may be surface water, groundwater, a watercourse, or a combination of these.

Recycled water – Water derived from wastewater systems or stormwater drainage systems that has been treated to a standard that is appropriate for its intended use.

Run-off – That part of precipitation that flows from a catchment area into rivers, lakes, watercourses, reservoirs or dams.

Security of supply – Reliability or surety of meeting water supply demand. Storages provide the capability to ensure a certain level of supply is available despite seasonal variations in stream flow

Sewerage system – The network of collection, conveyance, treatment and disposal facilities for wastewater. Also known as wastewater system

Sewer mining – The localized harvesting of raw sewage that is treated to a safe level as required for a particular use

Stormwater – Water that flows off roofs, properties and roads during rain events

Surface water – water flowing over land or collected in a dam or reservoir

Third party access – Arrangement whereby a new provider can apply for and be granted access to a monopoly's infrastructure to transport their product to customers

To take water – process of pumping, siphoning or diverting water from a watercourse. Also includes permitting stock to drink from a watercourse, a natural or artificial lake, a dam or reservoir.

Transfer/distribution system – A system of conduits (e.g. pipes, channels and aqueducts) used to supply water to customers. A distribution system is typically made up of large supply 'mains', which convey the water from major storages to smaller service reservoirs; these then feed into smaller 'service' pipes which deliver the water to the customers.

Trunk mains – major pipelines that transfer bulk water from its source (river, reservoir, treatment plant, bore field) to the distribution system.

Wastewater – Contaminated water before it undergoes any form of treatment. The water may be contaminated with solids, chemicals, or changes in temperature.

Water allocation plan – A legal document detailing the rules for the allocation, use and transfer of water from prescribed water resources, as well as the water-affecting activities that require permits.

Water licence – Volume of water that the licensee is authorised to take or to hold, representing a share of water from a prescribed water resource as defined in the relevant water allocation plan

Water sensitive urban design – An approach to urban planning that integrates the management of the total water cycle into the design of new developments to improve water use efficiency without adversely affecting lifestyle.

Water trading – Process of buying and selling either permanent or temporary water entitlements under an established set of rules.

Abbreviations

AARD – Aboriginal Affairs and Reconciliation Division

ABS – Australian Bureau of Statistics

ACCC – Australian Competition and Consumer Council

AMLR NRM Board – Adelaide and Mount Lofty Ranges Natural Resources Management Board

ASR – Aquifer Storage and Recovery

ASTR – Aquifer Storage, Transfer and Recovery

AuSSI – Australian Sustainable Schools Initiative

AWRIS – Australian Water Resource Information System

BASIX – Building Sustainability Index (NSW)

BoM – Bureau of Meteorology, Australia.

BSMS – Basin Salinity Management Strategy

CH_4 – Methane

CO_2 – Carbon Dioxide

COAG – Council of Australian Governments

CRC – Cooperative Research Centre

CSIRO – Commonwealth Scientific and Industrial Research Organisation

CSO – Community Service Obligation

DECS – Department of Education and Children's Services (Government of South Australia)

DEH – Department for Environment and Heritage (Government of South Australia)

DFC – Department for Families and Communities (Government of South Australia)

DFEEST – Department of Further Education, Employment, Science and Technology (Government of South Australia)

DPC – Department of the Premier and Cabinet (Government of South Australia)

DP&LG – Department of Planning and Local Government (Government of South Australia)

DSTO – Defence Science and Technology Organisation

DTED – Department of Trade and Economic Development (Government of South Australia)

DTEI – Department for Transport, Energy and Infrastructure (Government of South Australia)

DTF – Department of Treasury and Finance (Government of South Australia)

DWLBC – Department of Water, Land and Biodiversity Conservation (Government of South Australia)

EC – Electrical Conductivity

EDB – Economic Development Board

EIS – Environmental Impact Statement

EPA – Environment Protection Authority (Government of South Australia)

ESCOSA – Essential Services Commission of South Australia

EV – Environmental Value

EWR – Environmental Water Reserve

GL – gigalitre

GL/a – gigalitres per annum

GWh – gigawatt hours

Abbreviations

ICE WaRM – International Centre of Excellence for Water Resource Management

ICT – Information and Communications Technology

IPCC – Inter-Governmental Panel on Climate Change

IPOS – Code of Practice for Irrigated Public Open Space

kL – kilolitre

kL/a – kilolitres per annum

kL/day – kilolitres per day

LGA – Local Government Association of South Australia

LMC – Land Management Corporation

LRMC – Long Run Marginal Cost

MAR – Managed Aquifer Recharge

MDB – Murray-Darling Basin

MDBA – Murray-Darling Basin Authority

ML – megalitre

ML/a – megalitres per annum

ML/d – megalitres per day

MLR – Mount Lofty Ranges

NRM – Natural Resources Management

NWI – National Water Initiative

NWQMS – National Water Quality Management Strategy

OWS – Office for Water Security (Government of South Australia)

PIRSA – Primary Industries and Resources South Australia (Government of South Australia)

RMEM – River Murray Environmental Manager

SACES – South Australian Centre for Economic Studies

SAMDB NRM Board – South Australian Murray-Darling Basin Natural Resources Management Board

SARDI – South Australian Research and Development Institute, a division within PIRSA

SA Water – South Australian Water Corporation (Government of South Australia)

SIS – Salt Interception Scheme

SMA – Stormwater Management Authority

WAP – Water Allocation Plan

Watershed – the Mount Lofty Ranges drinking water catchments

WELS – Water Efficiency Labelling and Standards Scheme

WIA – Water Industry Alliance

WIRO – Water Industry Regulatory Order

WNARS – Waterproofing Northern Adelaide Regional Subsidiary

WPA – Water Proofing Adelaide

WQO – Water Quality Objective

WSAA – Water Services Association of Australia

WSUD – Water Sensitive Urban Design

WWTP – Waste Water Treatment Plant

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Water for Good

Water is our most valuable resource. It's fundamental to our health, our way of life, our economy and our environment.

Our growing population and reduced rainfall means South Australians think more about water than ever before. We are not only more aware of water issues, we are also placing greater value on water and instinctively taking action to save it.

Water is vital for the preservation of both quality of life and the environment for all South Australians. It also underpins growth in population and the economy – and these are critical to the State's future prosperity.

Water for Good is a plan that ensures there will always be enough water in South Australia. Most importantly, it will enable us to diversify our supplies to reduce our reliance on the River Murray and other rain-dependent water sources.

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