Water Proofing Adelaide

Exploring the issues – a discussion paper

Government of South Australia

action Salinity & Water AUSTRALIA

WaterCare *It's in your hands*

Foreword

Adelaide is a great city with a bright future – but not without water. Water is a vital resource which we are currently using at unsustainable levels. We must become more innovative and efficient in our water use to ensure a sustainable supply for future generations.

On average 60% of the City's mains water comes from catchments in the Adelaide Hills, the rest is drawn from the River Murray. Intake into the Hills reservoirs is very variable and in a dry year up to 85% of our mains water may be taken from the River. Both the quantity and quality of these water sources are threatened by development and other human activities. Ground water supplies too are being used faster than they can be replenished. This increases the risk of salinity, while reducing spring flows to our creeks and rivers. We know that salinity can do irreparable damage to our environment and strangle the regions agricultural industry so these risks could be perilous.

The reality is if Adelaide's water use continues to grow at the present rate we may exceed our current supply within 20 years.

In recognition of this problem the South Australian Government has initiated the Water Proofing Adelaide project. The project will explore the water issues facing Adelaide and the nearby semi-rural areas with the aim of creating a community-based strategy to secure our water supply for the long-term.

You are a crucial part of this strategy. Please familiarise yourself with the key issues, contribute your ideas, and think about the options put forward. I am confident that if we work together the Water Proofing Adelaide Strategy can assist us in creating a future where our economic aspirations are realised, and our social and environmental obligations fulfilled.

Premier Mike Rann

January 2004

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:

Kilolitre (kL)

One kilolitre is 1000 litres. In volume it represents one cubic metre and one kilolitre of water weighs one tonne. Kilolitres are the units most commonly used in referring to household water consumption with the average Adelaide household using about 300 kL each year.

Megalitre (ML)

One megalitre is 1000 kL or 1 million litres and is roughly the volume of an Olympic-sized swimming pool. 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 GL.

Acknowledgements

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This document has drawn on Planning For The Future Of Our Water Resources, a discussion starter produced by the Water Resources Strategy Committee for the Melbourne Area in June 2001 as part of the WaterSmart initiative of the Victorian Government. The Water Proofing Adelaide team is grateful for the assistance received from the WaterSmart project.

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1. Introduction

1.1 The Importance of Developing a Water Strategy for Adelaide

Recognition of water as a precious and limited resource, increasing demands on available supply, and concerns about environmental issues are forcing a worldwide review of the way societies are using and managing their water resources.

The future prosperity of South Australia relies on a secure water supply and its limits are a fundamental constraint that must be managed. Water supports human life and sustains the environment. A reliable supply of good quality water underpins sustainable industrial, agricultural, mining and urban development.

Adelaide's ability to rely on existing water supply sources to meet customer demand is influenced by many factors. Small changes in population and consumption growth rates can have a major impact on the lifespan of existing water resources. Some degree of prudence is needed when making decisions based on demand and supply projections.

Water demand in Adelaide is increasing and quickly approaching the levels of projected supply. Based on current trends it is estimated that by 2025 Adelaide's total water demand will be approaching 350,000 megalitres (ML) per year, which may exceed our expected supply in dry years. In addition, the water from some of our key sources is gradually deteriorating in quality. We must therefore manage our water supply wisely to ensure a sustainable resource. This means meeting our present needs and our desire for our continued growth and economic development without compromising the ability of future generations to meet their needs.

There are many potential solutions that may help solve the problems we face but none are without consequences. We need to understand what these might be, weigh them up carefully and make informed choices.

Four main possibilities for Adelaide are:

1. Reducing water use
2. Better management of our existing water systems
3. Development of new or alternate supplies
   (eg stormwater or wastewater reuse)
4. A combination of the above three

An aim of Water Proofing Adelaide is to gather the information necessary to make sound decisions that are effective, affordable and socially and environmentally responsible. Ultimately, solving Adelaide's long-term water supply issues requires input and a united commitment by the community and industry in addition to a coordinated and integrated approach across government. The government together with business, industry and the community need to work to ensure the future viability of our state by taking collective responsibility of their own water demands and the impacts they have on the surrounding environment.

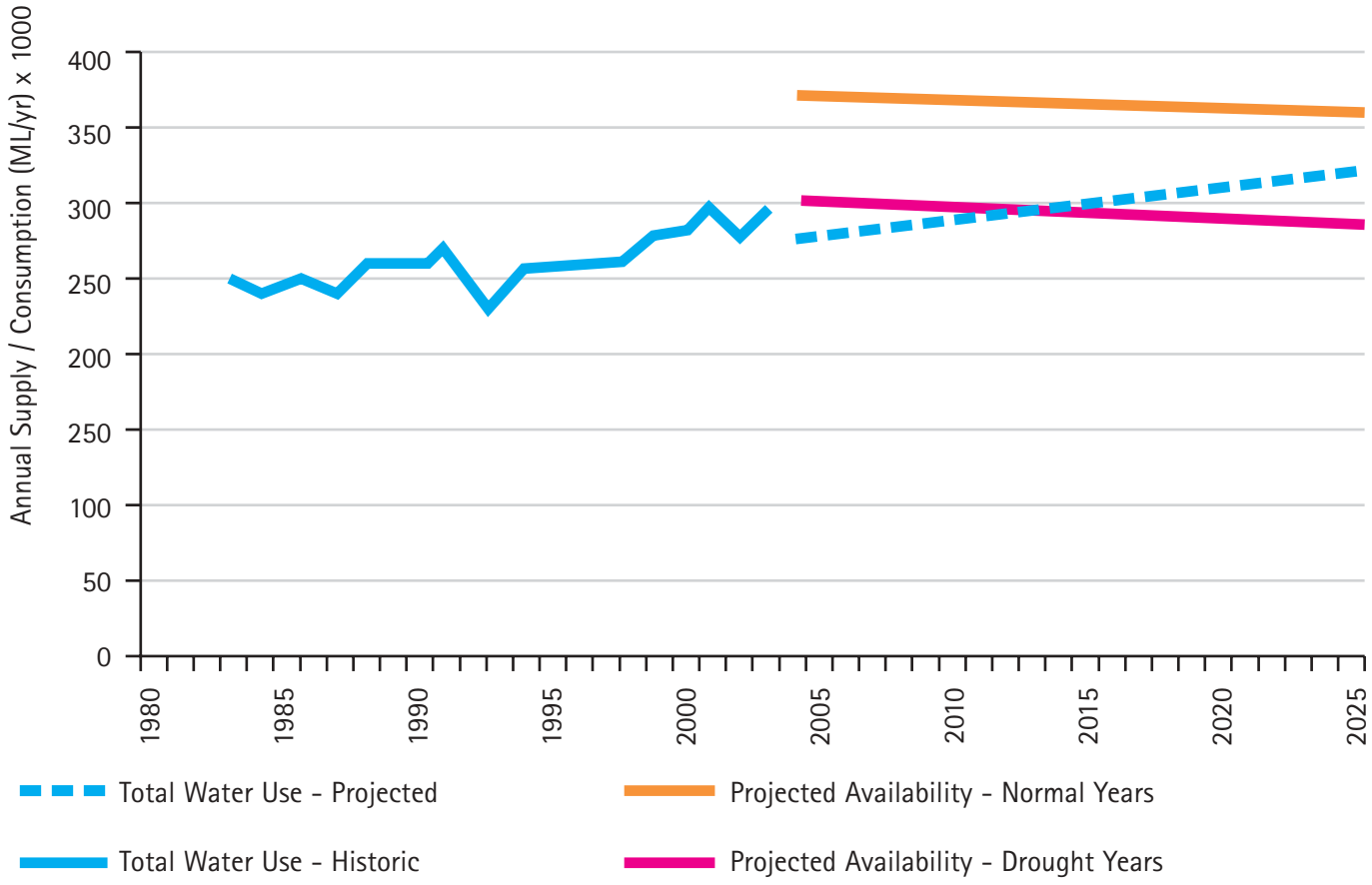

Figure 1.1a
Adelaide's water supply and demand projections

The projected reduction in availability reflects a number of factors including the development of farm dams, groundwater extractions and other human impacts especially on the Adelaide Hills catchments. There are also pressures to release water from reservoirs for environmental flow purposes though these are not reflected in the chart. The projected use line includes an anticipated 5% reduction in mains water demand as a result of the permanent water conservation measures recently announced by the State Government.

Developing a Strategy

Water Proofing Adelaide is charged with formulating Adelaide's future water strategy by March 2005. The strategy will set out a blueprint for the management, conservation and development of Adelaide's water resources to 2025 in a way that is cost effective, environmentally sustainable and in line with community expectations.

The project is jointly sponsored by the Minister for Environment and Conservation, Mr John Hill, and the Minister for Administrative Services, Mr Jay Weatherill. The project is overseen by a Steering Committee made up of senior executives from across Government and a community-based Strategy Advisory Committee that will ensure the community is properly consulted.

Memberships of the Steering Committee and the Strategy Advisory Committee as well as the supporting project team are detailed in Appendix I. The Terms of Reference for the project are outlined in Appendix II.

The Steering Committee and Strategy Advisory Committee are keen to ensure the following principles are adopted in the approach to this project:

- ***Openness of debate*** to encourage participation and exchange of views
- ***Prudence*** in decision making about the future
- ***Sustainability***, ensuring that our needs are met without compromising the ability of future generations to meet their needs
- ***Rigour*** in evaluating options and choice in the way forward

The Importance of Consultation

The project plan states that:

"The strategy will seek to engage the community and key stakeholders in decision making. The strategy for Adelaide will seek to develop a framework where the community can participate in, and contribute to, the strategy on an ongoing basis"

Accordingly, a consultation process has been developed featuring three key stages:

Stage 1

To make stakeholders and the community aware of the Water Proofing Adelaide project and the issues involved. This stage included the establishment of the Strategy Advisory Committee and the development of an introduction brochure, a website and the Water Proofing Adelaide forum held on October 16, 2003.

Figure 1.2a
Waterproofing Adelaide Boundary

Catchment Water Management Board Zones
Waterproofing Adelaide Boundary
Rivers
Pipelines

Stage 2

The second stage commenced after the forum and includes the launch of this Discussion Paper. It will include opportunity over a period of about five months for discussion and debate with the main purpose to capture suggestions from the public and stakeholders on options for the strategy.

Suggestions can be delivered through stakeholder briefings, public forums, the website, by mail or by phone. At the completion of stage 2 the project team will prepare a draft strategy to be forwarded to Government by the end of June 2004.

Stage 3

On release of the draft strategy, stakeholders – including the broader community – will have the opportunity to further discuss and comment on the issues raised and options put forward. Again, community forums and other opportunities to comment will be made available. The duration of the stage 3 consultation will be largely dependent on the acceptance of the draft strategy but a minimum of three months will be set aside for the purpose.

1.2 Water Proofing Adelaide Geographic Boundary

Water Proofing Adelaide focuses on Adelaide rather than South Australia as a whole. Water-related issues in the regional areas are often significantly different to those faced in the City. While most of the water used in the State is consumed in regional areas (predominantly for irrigation purposes), it is important to look at the specific problems facing Adelaide, though it is not intended to do so in isolation from the State-wide context.

The area chosen for the study essentially matches four major Catchment Board zones: (see Figure 1.2a)

- Northern Adelaide and Barossa
- Torrens
- Patawalonga
- Onkaparinga

The study will also take into account a number of areas immediately adjacent to these zones which obtain water from within the study area, or from the same sources, or where they influence water supplies within the study area. These include the Mount Barker urban area, the Mount Pleasant to Eden Valley areas, the Barossa District Council, and the Myponga River Catchment.

2. Current Situation – Water Use

2.1 Adelaide in Context of South Australia and Australia

Water in rivers, wetlands and aquifers is a precious natural resource and closely linked with the health of the entire State. Demands for water from urban populations such as Adelaide often compete with those of other major water users including natural ecosystems and irrigators.

The passionate debate surrounding flows in the River Murray illustrates the tensions that can occur when a water resource is insufficient to satisfy the needs of all the irrigation, urban and environmental users. Similarly, meeting the water needs of a wide range of users is also an issue for parts of the Adelaide Hills.

Integrated sustainable water resource management is required to satisfy these competing social, economic and environmental demands.

About 24,000 GL of water (roughly 20 times the volume of Lake Alexandrina) is consumed in Australia each year. Approximately 75% of the water is used for irrigated agriculture, 20% for urban and industrial purposes, and the remainder for rural uses including stock and domestic needs. The breakdown is similar for South Australia with an estimated 80% for irrigation, 15% urban and industrial and 5% rural towns and mining.

2.2 Historical Perspective on the Development of Adelaide's Water Supplies

Adelaide's population has grown from 315,000 in the 1930s to 1.1 million and the demand on water resources has increased accordingly. Construction of Millbrook and Mount Bold reservoirs between 1901 and 1945 gave Adelaide a degree of water security, but restrictions were still necessary to meet the City's growing needs.

The completion of the Mannum-to-Adelaide pipeline in 1954 – together with the South Para (1958), Myponga (1962) and Kangaroo Creek (1969) reservoirs, and further connections to the River Murray (Swan Reach Stockwell in 1969 and Murray Bridge Onkaparinga in 1973) – gave Adelaide and surrounding areas a security of supply that could accommodate future economic development.

2.3 Adelaide's Current Water Use

An extensive wastewater collection and treatment system was developed over time and is now a major contributor to the public health of the City. Four major wastewater treatment plants were constructed between 1932 and 1971. Wastewater from these plants at Bolivar, Glenelg, Christies Beach and Port Adelaide originally discharged entirely to Gulf St Vincent but in recent years a substantial upgrade has been undertaken to reduce the impact of these discharges and promote reuse.

Urban development has been allowed on natural floodplains to provide for Adelaide's growing population. As a result, stormwater pipes and drains were incorporated to accommodate the higher stormwater runoff from sealed urban areas and to alleviate flooding.

Adelaide's water use from all sources falls broadly into four major categories as shown below:

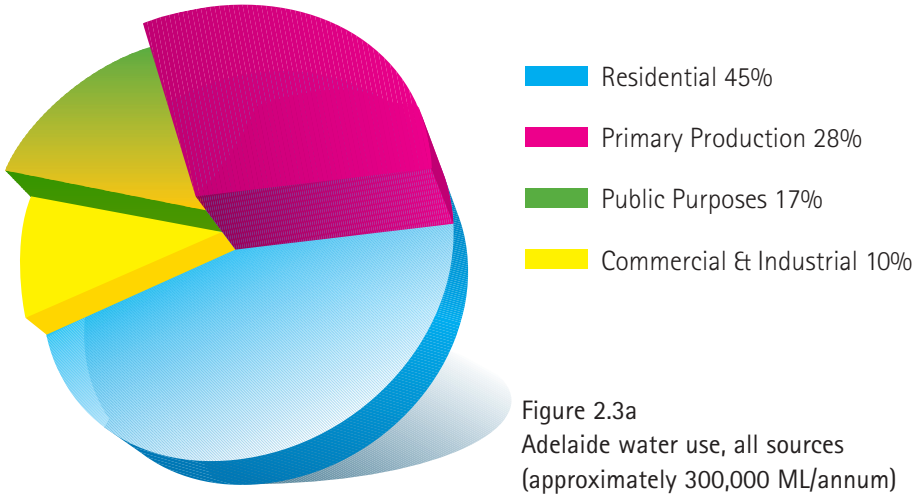

Figure 2.3a
Adelaide water use, all sources
(approximately 300,000 ML/annum)

Residential Water Use

The greatest proportion of water use in the region is for residential purposes. Most of this water is supplied through the SA Water mains though some groundwater and rainwater are also used. For 2002-03 the average Adelaide household used 284 kL of mains water.

For the typical suburban household, 60% of the water is used indoors and the remaining 40% externally, predominantly on the garden. The amount of outdoor watering can fluctuate significantly each year depending on the weather.

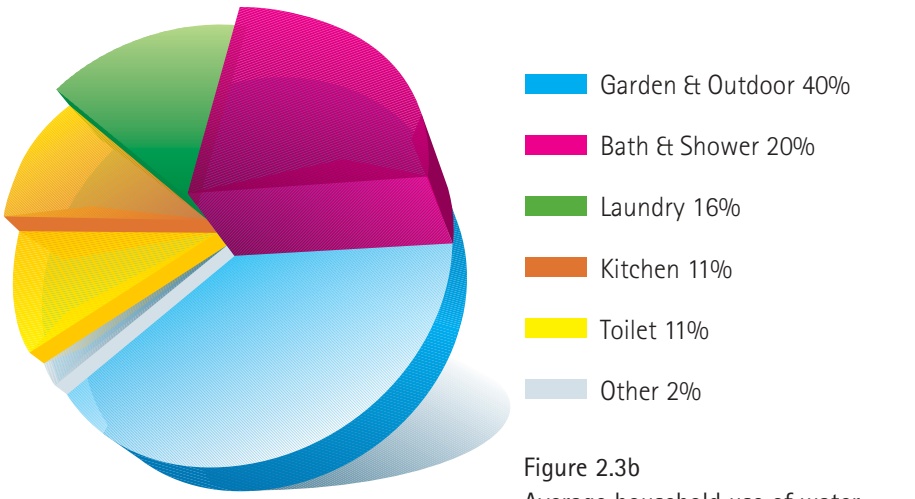

Figure 2.3b
Average household use of water

Water use in the home is gradually falling with the increasing popularity of dual flush toilets, which are now mandatory in new homes, and water efficient showers. More than 70% of homes now have dual flush toilets compared to 48% in 1994 while almost 40% have low flow showerheads, up from 26%. About 8% have water efficient washing machines.

Flats, units and apartments now make up about 11% of all dwellings. They usually have lower occupant numbers and smaller lawn areas, and so use less water per dwelling than traditional suburban homes.

Primary Production Water Use

The agricultural areas around Adelaide are an important source of food for the State.

Market gardening, fruit growing, cropping and grazing use water supplied from a variety of sources including rainfall, farm dams, local watercourses and groundwater.

Groundwater is extensively used in the Adelaide Hills and throughout the Northern Adelaide Plains, Willunga Basin and Barossa Valley. In all of these areas, groundwater usage is equal to or greater than the sustainable available limits of the aquifer.

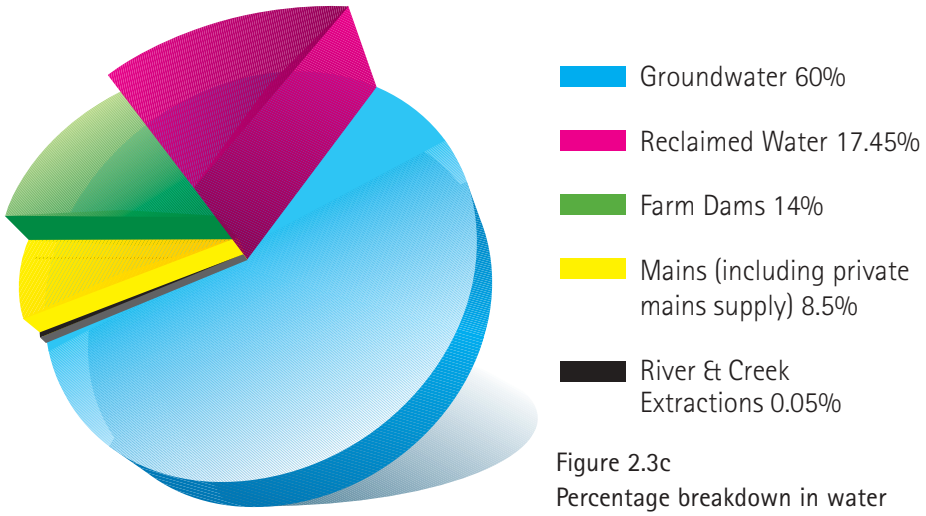

Figure 2.3c
Percentage breakdown in water use for primary production

In the Willunga Basin and Northern Adelaide Plains areas, water is being recycled from two of Adelaide's wastewater treatment plants. In the Barossa Valley, a scheme to transfer water from the River Murray to supplement irrigation has also been commissioned. The inability of the limited existing water resources to sustain the growing local irrigation industries has driven the development of these schemes, which are now the largest in Australia.

Figure 2.3d shows how the total number of hectares irrigated in Adelaide and surrounding semi-rural areas has increased over the past decade. The major irrigated crop types range from grapes in the Barossa and Willunga Basin areas to potatoes in the Northern Adelaide Plains (NAP) and pasture in the Adelaide Hills (Central MLR). There has been a recent trend to higher value irrigated crops such as grapes and horticulture, which are replacing pasture.

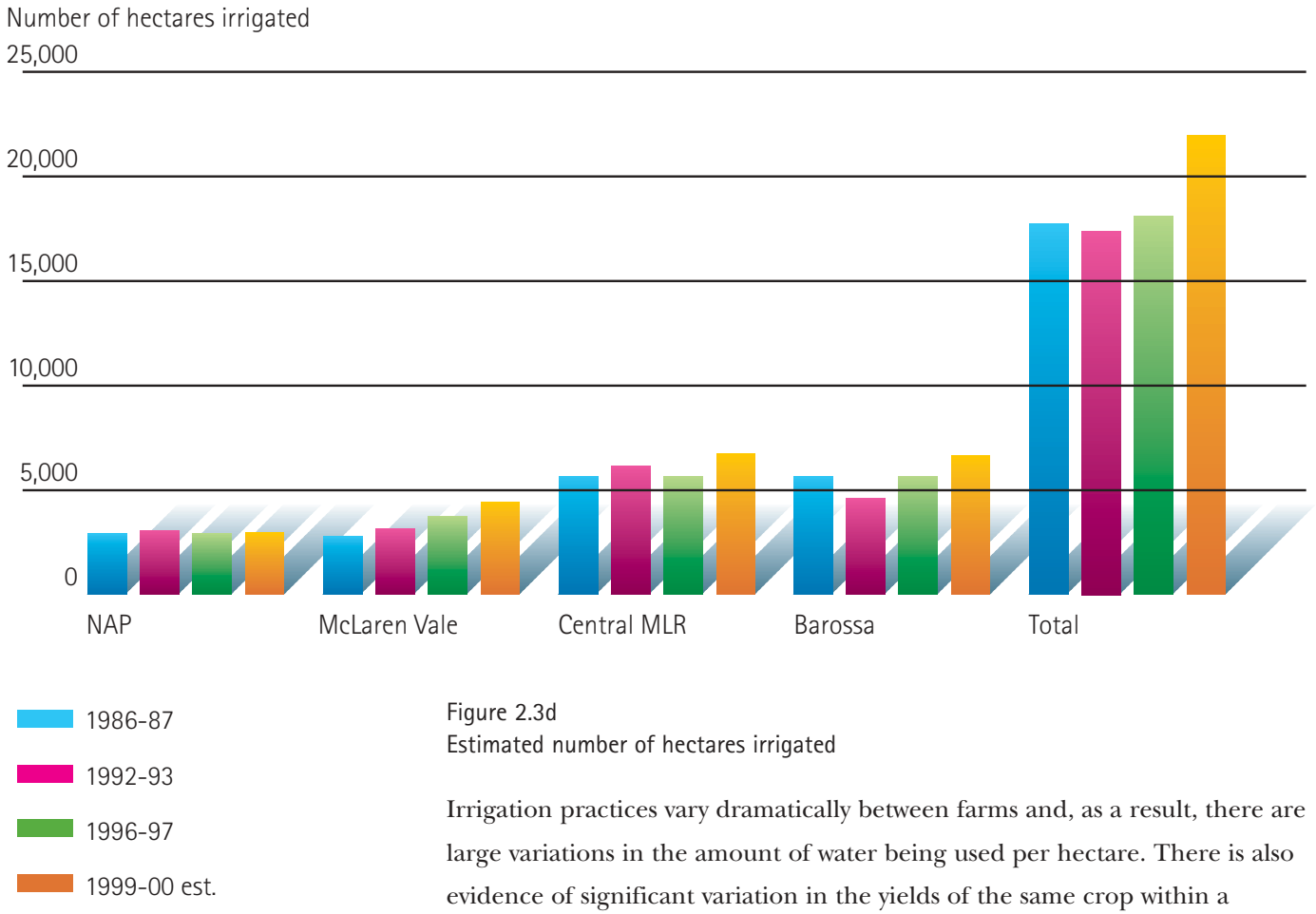

Figure 2.3d
Estimated number of hectares irrigated

Irrigation practices vary dramatically between farms and, as a result, there are large variations in the amount of water being used per hectare. There is also evidence of significant variation in the yields of the same crop within a district. In some cases, using more irrigation water does not result in higher crop yields or quality. Grapes, for example, not only use less water than other crop types but deteriorate in quality if too much water is applied.

Mains water makes up only about 8.5% of the water used for primary production in Adelaide though River Murray water is used extensively for irrigation in rural areas. While improvements can still be made in some areas, South Australian irrigators are among the most efficient in the country in terms of water use. Further, the following chart illustrates that the economic productivity of South Australian irrigators is well ahead of other users of the River Murray.

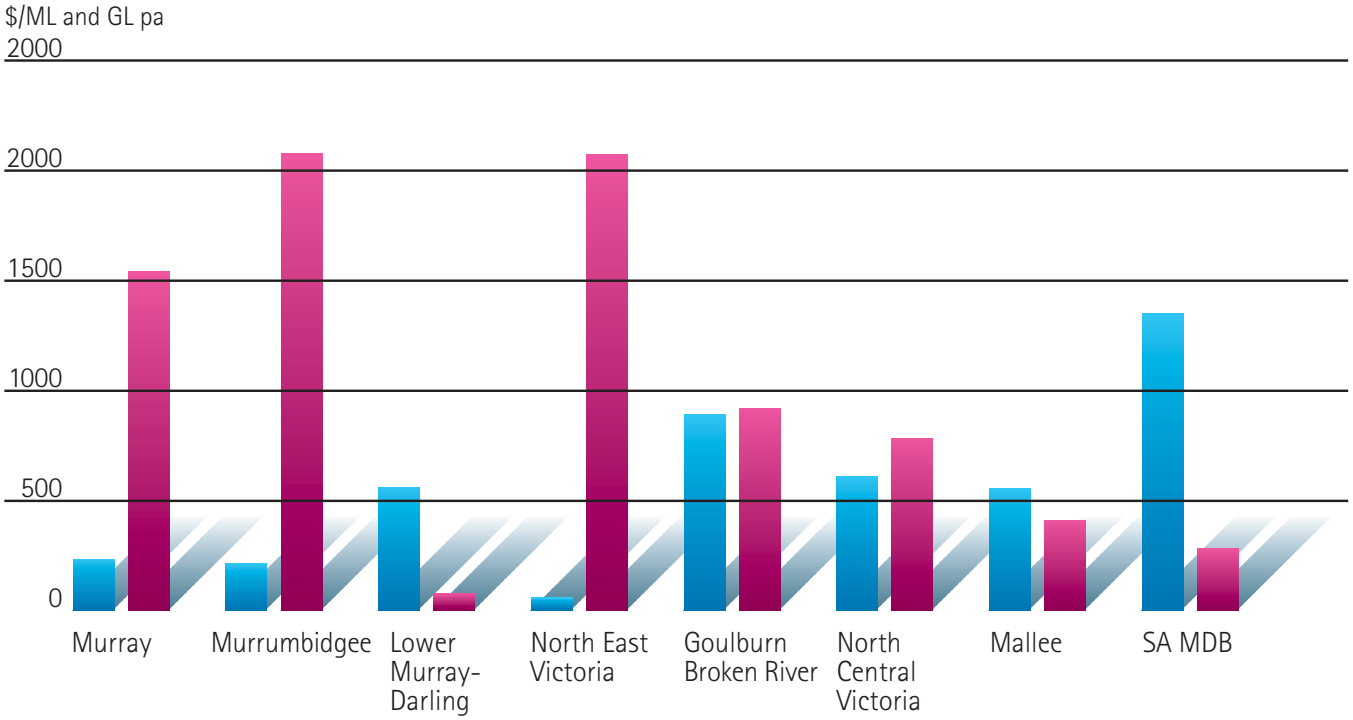

Figure 2.3e
Comparison of economic productivity of irrigation areas within the Murray-Darling Basin

Public Purposes

Irrigation of parks and ovals makes up the majority of water use for public purposes. Other uses are in public buildings, fire fighting, public swimming pools etc. Most of this water is still supplied through the mains system but increasingly irrigation water is being obtained from other sources including groundwater, stormwater, treated wastewater and by extraction from creeks and rivers.

Industrial and Commercial Water Use

Consumption of mains water by major commercial and industrial users is generally reducing as companies seek to lower their water costs.

Some industries now utilise groundwater and may have onsite desalination and softening treatment to meet specific production requirements. There may be other opportunities to use non-potable water for production. The softness of treated stormwater makes it potentially useful in the linen cleaning industry while heavy manufacturers such as foundries and some sectors of the automotive industry may also be able to use non-potable water.

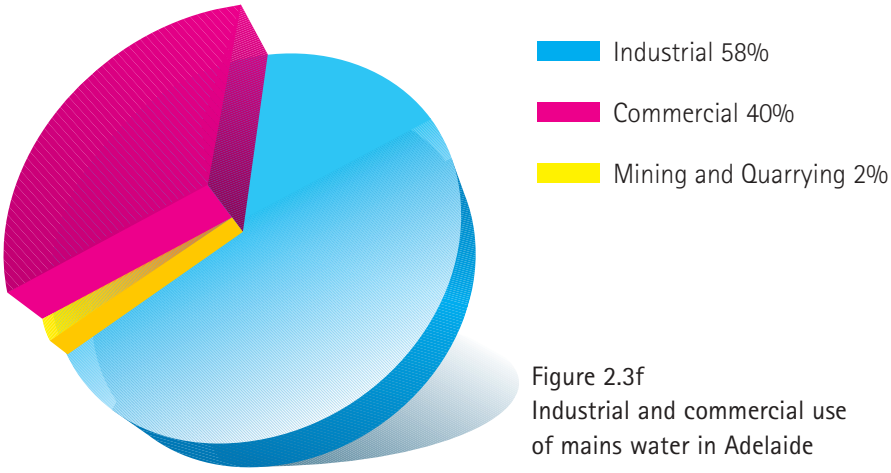

Figure 2.3f
Industrial and commercial use of mains water in Adelaide

Use of Mains Water

The current average annual total of Adelaide's mains consumption is estimated to be 200,000 ML (about two thirds of the total water use) but can rise or fall by 12% depending on the climate. Until 1978, Adelaide's demand for potable mains water grew around 4% per year. Since then, the rate of per capita consumption has decreased but total demand is still rising about 0.5% per year. The decline in water use per capita is due to factors such as higher density dwellings, user pays pricing, dual flush toilets and a general increase in the community's environmental awareness. Overall consumption continues to rise due to population growth and increasing agricultural demand.

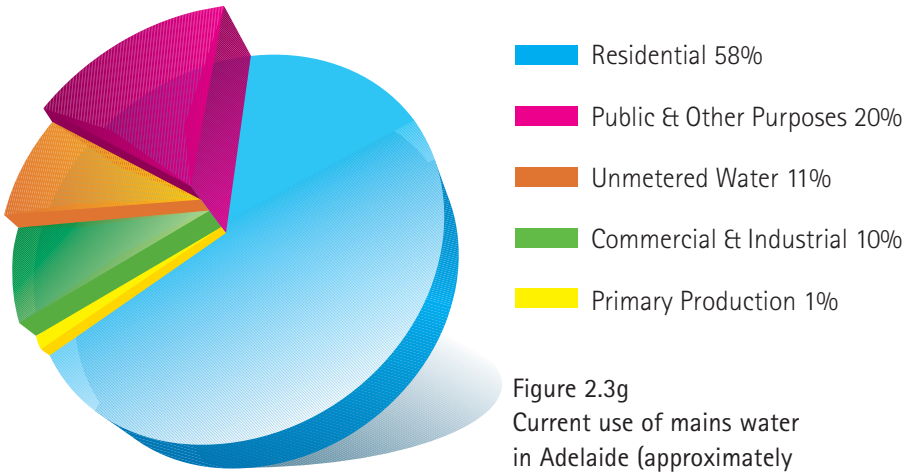

Figure 2.3g
Current use of mains water in Adelaide (approximately 200,000 ML per annum)

Unmetered water use includes quantities attributable to firefighting, leakage, theft and for operational purposes including mains flushing and losses during repair work on mains. It is paid for by the access charge applicable to all properties that have access to mains water.

Small leaks can often occur as pipes age. These can be very difficult to detect especially in sandy soils where the water tends to soak into the ground, leaving little sign of leakage (see also Page 41). By international standards South Australia has very low leakage rates but there may still be opportunities for improvement.

3. Current Situation – Water Sources for Adelaide

Since the 1950s, mains water supplies to Adelaide have been supplemented by pumping from the River Murray. The Adelaide Hills and River Murray water resources are complementary and their relative contributions can vary significantly depending on local rainfall. On average, the Adelaide Hills supplies 60% of Adelaide's mains water and the River Murray 40%, although this can vary enormously from year to year. Figure 3a indicates the volumes of water used from each source over the past 20 years and illustrates how important the River Murray is to Adelaide especially in dry years. Additional minor (but increasingly developed) sources of water from the Adelaide urban areas also contribute to our total supplies. These include groundwater, treated wastewater, stormwater and rainwater.

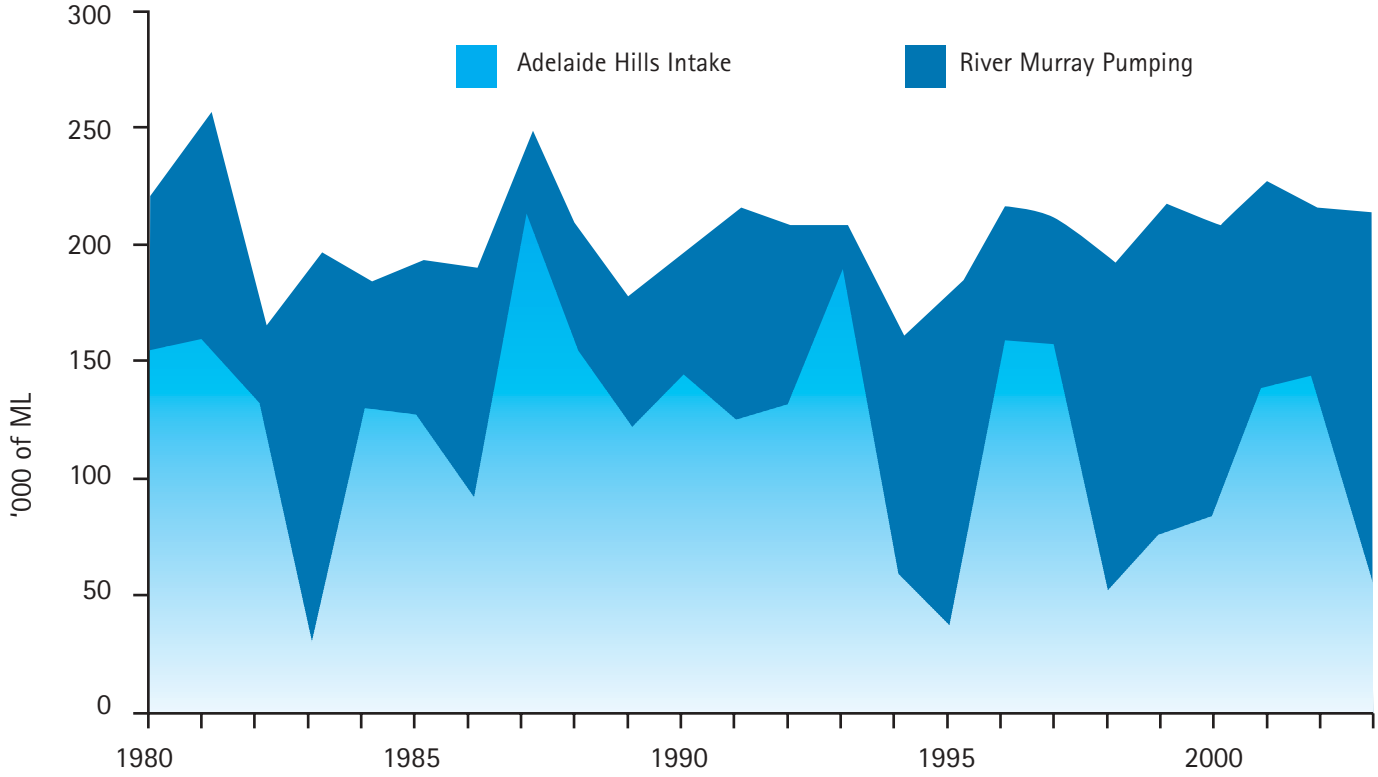

Figure 3a
Adelaide's mains water supply sources

3.1 Adelaide Hills Catchment

Only a small portion of the Adelaide Hills catchment area is reserved to protect the water supply, with the remainder largely dedicated to economic uses such as agriculture. A share is also reserved for conservation and recreation purposes. In Melbourne, Perth and Sydney, large areas of the water catchments are uninhabited, providing far greater protection of water supply and quality. The Adelaide Hills catchments include the Torrens, Onkaparinga, South Para, Little Para and Myponga Rivers. Water is collected from the Adelaide Hills from rivers and creeks or via small weirs that divert some of the flows into storages.

The total annual amount of water collected in the Adelaide Hills reservoirs has averaged approximately 125,000 ML over the past five years.

The Adelaide Hills supply system includes:

- South Para system – South Para, Warren and Barossa Reservoirs
- Little Para system – Little Para Reservoir
- River Torrens system – Millbrook, Kangaroo Creek and Hope Valley Reservoirs
- River Onkaparinga system – Mount Bold and Happy Valley Reservoirs
- Myponga system – Myponga Reservoir

Groundwater extraction, farm dam development, some forms of agriculture or forestry and the likely need to release water for environmental flows are all reducing the amount of water available from the Hills reservoirs.

Agriculture in the Adelaide Hills contributes significantly to the State economy. Most South Australians also appreciate the uniqueness of the Hills and many choose to live there because of the lifestyle and environment. As demand for water increases we need solutions that meet the social, environmental and economic needs in a balanced manner.

3.2 River Murray

The River Murray is an extremely important system, not only from a water supply viewpoint but also because of its existing environmental and social value.

The River Murray is a regulated river system with a series of dams, locks and other storages used to control flows. Prior to regulation, the river flows were highly variable. Before European settlement, it is estimated they varied between 5000 GL per year and 40,000 GL per year. Average annual flows are now about 13,800 GL, of which over 80% is diverted for human purposes.

South Australian water users have had reliable access to River Murray water since adoption of the 1914 River Murray Waters Agreement, forerunner to the current Murray Darling Basin Agreement. The Agreement allows New South Wales and Victoria to use 50% each of the water captured in the Murray Darling Basin Commission storages (as well as any water that runs through their State tributaries) - so long as South Australia receives at least 1,850,000 ML per year. Our State's guaranteed minimum entitlement is only reduced in drought years, in which case the available resources are shared equally among the three States. South Australia's guaranteed minimum entitlement increased to 1,850,000 ML per year from the original Agreement's 1,550,000 ML per year following commissioning of the Dartmouth Dam.

Over 60% of this entitlement is left in the river for environmental purposes, however high evaporation rates in the Lower Lakes mean the environmentally sensitive areas around the Murray mouth and Coorong only benefit when the State receives more than its minimum entitlement flows.

South Australia contributes significantly to the cost of Murray-Darling Basin system works though we use only about 6% of the resource.

In exceptional circumstances such as during the recent drought, the entitlement flow to South Australia is not able to be provided. Since Adelaide draws its water from the end of the river system, it is vulnerable to the impacts of upstream activity. The biggest potential issue for South Australia is increasing salinity levels brought about by the high degrees of extraction and intensive irrigation near the river.

The Murray-Darling Basin Commission and the States have had to spend a significant amount of money in the past decade installing salt interception schemes to help combat the problem. It is likely substantially more expenditure will be needed in the future. Many irrigators are also assisting through revegetation and improved irrigation practices.

South Australia contributes significantly to the cost of Murray-Darling Basin system works including the major upstream storage dams and environmental programs to protect water quality. South Australia's share of total River Murray allocation is much less than its accumulated share of financial contributions to the Murray-Darling system. This is offset by a much higher level of security in its allocations.

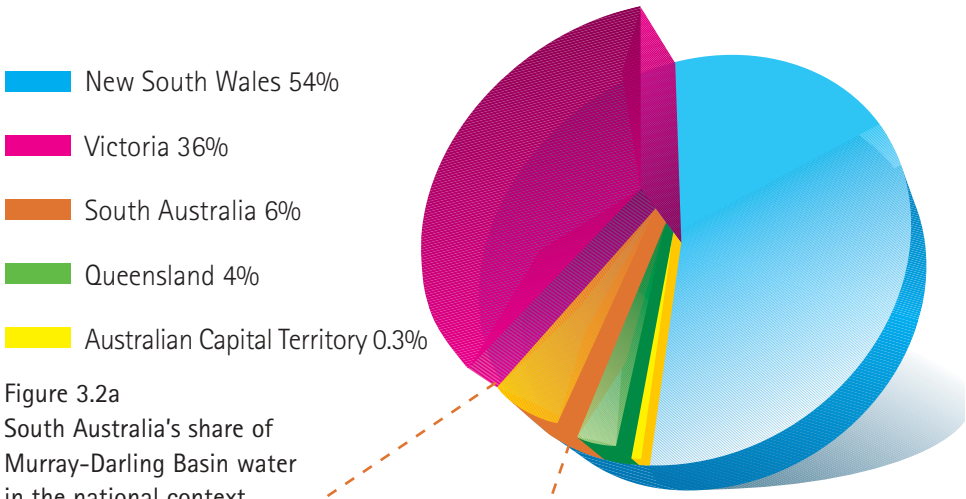

Figure 3.2a
South Australia's share of Murray-Darling Basin water in the national context

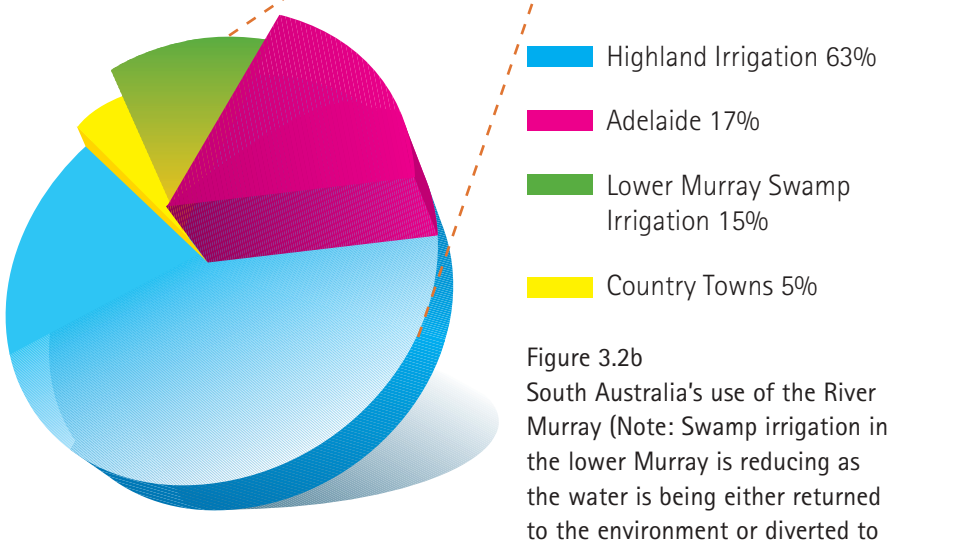

Figure 3.2b
South Australia's use of the River Murray (Note: Swamp irrigation in the lower Murray is reducing as the water is being either returned to the environment or diverted to higher economic value uses)

Adelaide and surrounding areas use a small proportion of the total water sourced from the Murray-Darling Basin. Overall potable water use in the project region is about 1% by volume of diversions from the total Murray-Darling Basin system, although this may vary from less than 0.5% to 2% in any given year. It should be noted though that although the Eastern States generally use far more River Murray water, South Australia's share of the River is far more secure. In fact South Australia's entitlement from the River is guaranteed in all but very low flow years as occurred in 2002-03.

River Murray water is supplied to Adelaide through three pipelines which transfer water from:

- Murray Bridge to the Onkaparinga system
- Mannum to the Torrens, Barossa and Little Para systems
- Swan Reach to the Barossa system

3.3 Urban Areas

As stated above, some water is also obtained from the more urbanised areas of Adelaide.

Groundwater

An estimated 51,000 ML, mostly for irrigation use, is sourced from groundwater particularly within the Northern Adelaide Plains and Willunga Basin areas. In some areas there is substantial pressure on the groundwater resource and the Government has management arrangements in place to regulate use. Other areas including the Adelaide Plains and the Adelaide Hills remain largely unregulated.

Treated Wastewater

Wastewater is the treated water that comes from wastewater treatment plants. Australia has become a world leader in the use of treated wastewater and South Australia has the highest level of wastewater reuse per capita in the country. Reuse of wastewater has increased in recent years and in 2002-03 topped 16,000 ML. This represents about 19% of Adelaide's total wastewater.

The majority is used to support expansion of irrigation in the Northern Adelaide Plains and Willunga Basin that cannot be satisfied solely by the local water resources. Another significant advance is the Mawson Lakes development. Colour coded pipes installed during construction of the development will eventually deliver recycled water to households for garden irrigation and toilet flushing. While beneficial, such projects are potentially very costly due to the comparatively small scale.

While there may be further opportunities for wastewater reuse, these become more costly depending on the size, the distance from the available sources to the point of need and the purpose for which the reclaimed water is to be used. Further, the salinity of wastewater is greater than mainswater and varies between treatment plants. This may limit the reuse of wastewater for some applications eg. irrigation of some plants. Reuse of wastewater to substitute water supply is an area that requires further examination and feasibility studies.

Taking the initiative

Australia has become a world leader in the use of treated wastewater and South Australia has the highest level of wastewater reuse per capita in the country.

Virginia Pipeline Project

This multi million dollar project commenced in 1998 and involves delivering Class A standard reclaimed water from the Bolivar Wastewater Treatment Plant to irrigators in the Northern Adelaide Plains. The Class A standard has been achieved through the investment of over $30 million by SA Water in a dissolved air flotation and filtration plant to treat the water before it is delivered to the Virginia scheme. A privately operated scheme then supplies reclaimed water via a 70 km pipeline network to growers at a charge significantly lower than mains water. Nutrient discharges to Gulf St. Vincent have reduced and the scheme will also help reduce over-exploitation of groundwater resources in the Northern Adelaide Plains.

Willunga Pipeline

Class B standard reclaimed water is being piped from the Christies Beach Wastewater Treatment Plant to McLaren Vale to be used on vineyards. With additional implementation there is potential to increase the area of irrigated vineyards in the region.

Stormwater

More than 160,000 ML of stormwater flows into Gulf St Vincent every year on average. This represents a very large potential water resource for Adelaide. Stormwater has very low salinity levels and is much softer than mains water. However, it can also contain high levels of pollutants including animal faeces, heavy metals and hydrocarbons.

Stormwater reuse schemes have been developed in recent years for irrigation and industrial uses. At Parafield Airport stormwater is captured and supplied to Michell Australia's wool processing plant. Another example is at the Morphettville Racecourse where stormwater is used for irrigation. All major stormwater schemes to date employ an Aquifer Storage and Recovery (ASR) system. An ASR allows the collection of stormwater during the winter months and its storage in underground aquifers for later use.

Taking the initiative

South Australia leads the nation in stormwater capture and use

Brompton Parfitt Square Urban Re-Development Project

In 1996 the City of Charles Sturt, supported by Stormwater Drainage Subsidy Scheme (now Catchment Management Subsidy Scheme) funding, constructed the Parfitt Square stormwater scheme. The scheme was designed by UWRC. All forms of runoff – from residential roofs, gardens, a public reserve and residential streets – are retained within a small reserve and ASR scheme. The scheme captures all runoff up to and including the 'once in 100 year' design flow event. The scheme was a world first and was awarded the 1997 National Local Government Innovation Award in Engineering and Infrastructure.

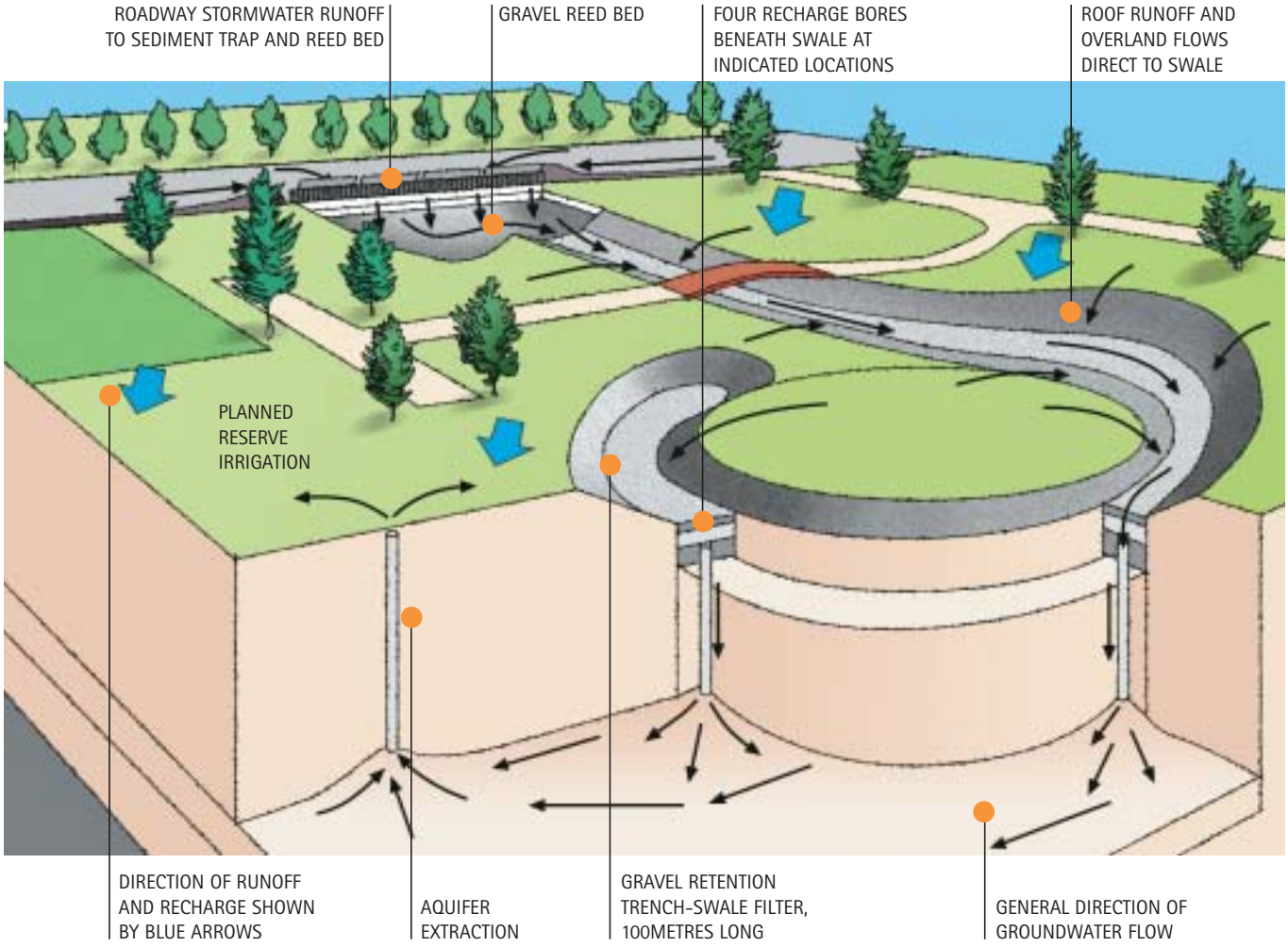

Figure 3.3a
Key elements of the Brompton Parfitt Square Stormwater Management System
Urban Water Resources Centre, University of SA

Stormwater reuse technology is still being developed. Successful schemes to date have had some combination of the following:

- A suitable creek or drain with a significant stormwater resource
- Sufficient space to capture, store and treat the water
- Suitable aquifers underlying the site with capacity to store the treated water for later use
- A large 'customer' nearby. This has generally been a non-potable industrial or irrigation use customer

Taking the initiative

Aquifer Storage and Recovery (ASR)

South Australia has the highest uptake of innovative stormwater wetland-ASR projects in Australia and many additional schemes are under consideration.

Salisbury Council has taken an innovative approach to water resource management issues over many years, beginning with the construction of the Paddocks wetlands in 1975.

A number of projects, such as the Parafield Airport ASR scheme, involve local council developing and selling water to local industries, substituting mains water with lower cost treated and recharged stormwater. The Parafield Airport wetland and ASR scheme diverts stormwater from the local stormwater network. The scheme, supported by Salisbury Council and the Northern Adelaide and Barossa Catchment Water Management Boards, has the potential to ultimately provide about 3 GL of water per year. Michell Australia was the first commercial business to receive water from the scheme. The cost of this water is less than the price of mains water.

The Mawson Lakes ASR Project is a highly innovative urban greenfields housing development. The project, a joint venture between Land Management Corporation and Delfin Lend Lease Consortium, will cater for 10,000 people by 2010.
The contract requires the joint venture to achieve specified benchmarks in each of a number of areas of innovation. The concept involves stormwater and treated wastewater recycling through a scheme involving wastewater treatment, constructed wetlands, aquifer storage of stormwater and a dual reticulation water supply. The various components of the system will be owned and operated by SA Water and the City of Salisbury.

The Government has helped fund a major ASR trial using reclaimed water from a municipal wastewater treatment plant in the Northern Adelaide Plains region. The trial is a joint research agreement with United Water and the CSIRO. The international importance of this project has been recognised by the project partners being awarded an international water prize by UNESCO.

Creeks and Rivers

A small amount of water is extracted from urban creeks and rivers, usually for irrigation of either market gardens or parks. For example the Adelaide City Council takes water from the Torrens Lake for irrigation of some of the parklands around the city. In most cases there are no requirements to monitor the quantities of water taken.

Rainwater Tanks

Rainwater tanks are very popular in Adelaide compared to other cities. An estimated 37% of Adelaide households have a rainwater tank. Rainwater tanks are predominantly used for drinking purposes. It is estimated less than 1000 ML is used in Adelaide each year, which represents less than 0.5% of total water use. Some councils in the metropolitan area have established rainwater tank demonstration sites to encourage further rainwater use. It is possible to use rainwater for other purposes in the house (such as for the toilet, laundry and hotwater service) however, this would involve set up costs for a water pressure pump and backflow prevention device.

4. Water Quality and Environmental issues

While it is natural to think of water quality as largely an environmental issue, it is also important to realise much of our economy is reliant on good quality water. Access to good quality water is essential to all forms of economic activity from tourism through to manufacturing. While Adelaide's mains water is, by world standards, of very high quality, the health of our waterways is important in maintaining that standard. This chapter discusses some of the issues behind the threats to our water supply in Adelaide.

4.1 Threats to Our Water Environments

With proper management we have the opportunity to ensure that we have good clean waterways that support healthy ecosystems and which can be used for economic and social benefits. However, at present many of our water environments are polluted. This pollution has two main sources:

- Point source pollution comes from readily identifiable sources such as industrial pipes and household septic tanks. This type of pollution is regulated by the Environment Protection Authority (EPA) but can be difficult to monitor
- Non-point source pollution, also known as diffuse pollution, occurs over a wide area and is often related to particular land uses. Major forms of non-point source pollution include seepage from septic tanks, sediment run-off from construction sites, pesticides and fertilisers. This type of pollution is regulated by the EPA through the Environment Protection Water Quality Policy (2003) and the general duty of care section of the Environment Protection Act (1993).

The community, business and industry can cut the amount of pollution produced by reducing the amount of resources used in production and to convert waste.

4.2 Pollution of Urban Stormwater

Urban stormwater is rainfall run-off from built up areas such as buildings, streets, footpaths and car parks. It can contain litter, dust, soil, rubber, oil and grease from roads, garden waste, chemicals, viruses, pathogens, bacteria and excess nutrients from animal faeces and fertilisers. This pollution can cause major environmental damage. It can kill fish and other aquatic flora and fauna and make water unsafe for swimming.

In summer, nutrients carried into areas such as the Torrens Lake by winter storms (both urban and rural runnoff) can lead to an increase in the growth of algae. Algal blooms can have varied adverse effects on an ecosystem. Some blue green algae (cyanobacteria) release toxins when they die which can kill fish and present a health hazard for humans who come into contact with the water by causing skin irritation, swollen lips, eye soreness, earaches and asthma.

Nutrient enrichment of Gulf St Vincent from stormwater and wastewater discharges has resulted in an increase in algae that attach themselves to other aquatic plants for support (epiphytic algae). The growth in some types of algae has resulted in the loss of more than 6000 hectares of seagrass between Port Gawler and Aldinga. Loss of seagrass has led to more sediment in our coastal waters, an increase in coastal erosion and a dramatic loss of biodiversity in reefs.

Sedimentation occurs when mineral and organic particles are transported from their place of origin by water, wind, gravity or ice. This process occurs naturally but human activities can accelerate it. This causes unnaturally high levels of sediment in our rivers, lakes and streams leading to increased turbidity, in-filling of creek pools and weed growth. High levels of sedimentation can also smother plants, suffocate fish and make habitats unsuitable for native wildlife.

Pollutants such as oils, heavy metals and chemicals (mostly from cars and trucks) can cause substantial environmental damage. They often contaminate the stormwater that flows untreated into natural waterways. Oil and grease are toxic to animals and plants and form a film over the water surface, making it difficult for organisms to breathe. Heavy metals from roads and industrial sites such as cadmium, chromium, copper, zinc and lead are also toxic. These substances can collect in aquatic animals such as mussels and have a dangerous impact through the food chain.

Taking the initiative

'Environment-Friendly' Carpark, City of Marion

The system incorporates filtration, infiltration and ASR. The source-control philosophy adopted in relation to the car-park and ancillary structures ensures that these areas no longer contribute to downstream flooding or pollutant loadings in any situation up to and including the 'once in 100 years' storm event. A world first, the environmentally friendly design incorporates elements of both standard and innovative technologies in a unique manner to produce the goals of functionality, aesthetics and local stormwater capture/reuse.

4.3 Alteration of Natural Flows

Water is pumped from rivers and underground water supplies for use by rural towns, farms, industries and cities. Farms also capture rural run-off and store it in dams. Many rivers feed dams and reservoirs for public water supplies and hydro-power. They are also used as transport routes for boats.

While these activities provide economic and social benefits, there are many adverse environmental impacts associated with altering the natural flow of rivers. These include the decline and loss of native species of plants and animals, the encouragement of habitats favourable to pest species such as carp and redfin, declining water quality and loss of amenity.

Major efforts are now under way to understand the impact of river regulation and to develop strategies to restore and/or protect the natural flow regime of rivers and creeks with the ultimate aim of improving the environmental condition of our waterways.

4.4 Clearing Vegetation

Native vegetation clearance has wide-ranging impacts on water quality, local habitats and biodiversity. Clearing the landscape of trees and shrubs also changes the rate of rain run-off and increases erosion. This means more sediment, nutrients, salt, pesticides and other toxicants are transported into rivers and streams.

Growing towns and cities cause an increased volume of stormwater due to their large area of paved surfaces – such as roads, roofs, footpaths and carparks – compared to well-vegetated catchments.

4.5 Loss of Habitats

Habitats are the places where organisms live. Loss of habitat can range from the removal of whole wetland ecosystems to the removal of a small stand of reeds in a swamp or creek. The loss of biological diversity can limit the ability of the local environment to tolerate the effects of climatic variation and human activity. It can also affect the ability of the environment to recover from the effects of a major event such as a drought or the significant discharge of a pollutant.

4.6 Increasing Salinity

As mentioned earlier, salinity is a major problem facing the River Murray. High salt concentrations in water affect taste and cause pipes and other infrastructure to deteriorate faster, adding to community costs. Salinity also has a major impact on crop yields and farmland sustainability.

The effect of salinity on the environment is widespread. Individual plants may be replaced by salt-tolerant species while animals may die as their food source disappears. Ultimately, entire ecosystems can change. The surface movement of saline water across the landscape increases sediment erosion through the breakdown of the soil structure. Similarly, saline groundwater can seep into rivers affecting water quality.

In general, increasing salinity levels lead to a reduction in biodiversity and an increase in the prevalence of more salt-tolerant species.

4.7 Threats to Groundwater

Factors influencing available groundwater supplies include water resource development, agricultural land use, acid sulphate soils, urban and commercial development, mining and plantation forestry.

Overuse of groundwater supplies can dehydrate many ecosystems and habitats by lowering the groundwater level to beneath the rooting depth of many plants. This also reduces the water seeping into rivers and destroys habitats in cave and aquifer ecosystems.

Excessive pumping of groundwater can also lead to the ingress of saline water, increased pumping costs and potentially total and permanent failure of the aquifer

Diversion or capture of surface waters in dams can elevate groundwater levels and cause similar problems. Some groundwater-dependent species may in fact die from waterlogging. The elevated groundwater levels hold accumulated salts and the higher salinity levels can lead to plant death and the loss of native fauna that depend on those plants.

Excavation during construction activities and the lowering of groundwater levels can activate acid sulphate soils which severely impact aquatic ecosystems.

New urban and commercial developments can change groundwater levels through increased domestic watering and other recreational and industrial uses. In turn, native vegetation and wetlands are threatened. Urban development can also affect the quality of groundwater via the effluent from septic tanks, leakage from underground fuel tanks and the use of chemicals and fertilisers.

Plantation forestry reduces the surface water runoff, groundwater recharge and ultimately the pressure on underground water. All of these impacts may affect groundwater-dependent ecosystems in similar ways to those mentioned above. However, the lowering of groundwater levels may be beneficial to ecosystems where the water table has been unnaturally elevated by irrigation or land clearance.

4.8 Maintaining a Healthy Water Balance

Constructing locks and weirs has allowed the River Murray to be used as a constant supply of water as well as a source of recreation and transport. Wetlands and floodplains however, have been significantly affected by the changes in the River Murray. Wetlands are the 'kidneys' of a river system. Maintaining the health of a wetland requires a broad range of flooding regimes. While it is important that they sometimes be flooded, on other occasions they need to dry out.

The development of farm dams and reservoirs in the Adelaide Hills, while being an essential part of our water supply system, can significantly alter the water cycle. It is estimated that in an average year, farm dams in the Adelaide Hills intercept more than 16,500 ML of water. The volume of farm dams upstream of reservoirs is managed by limiting dams to a size equal in volume to 50% of the runoff from their property.

In streams below the metropolitan reservoirs, recent studies have found that the 132,000 ML diverted from the Mt Lofty Ranges catchments by reservoirs has an adverse impact on water dependant ecosystems. The impacts are two-fold:

- The catchment is too dry downstream of reservoirs and weirs diverting flows. Areas where this has been identified as an issue include the Onkaparinga Gorge and Para Wirra Gorge
- River Murray diversions to the Mount Lofty Ranges prevent the rivers from completing their natural dry out cycle during summer.
  This is an issue mainly in the Torrens and Onkaparinga catchments

Some sources of water are not suitable for the intended use and require treatment to improve quality. For the mains water system, significant investment has been made in water treatment plants across Adelaide. These plants treat the water by filtration and chlorination, removing sediments, colour and pathogens to achieve drinking water standards. There have still been concerns over contaminants from the Adelaide Hills catchments that are not easily removed by existing water treatment plants. These include some pathogens and endocrine contaminants able to pass through extremely fine filters or which may be resistant to traditional methods of disinfection. Sources of these contaminants include un-maintained septic tanks, farm chemical run-off and intensive land use.

Catchment Water Management Boards in conjunction with Government agencies have reviewed these issues. Catchment plans are being implemented but there is still much work to do if we are to maintain healthy ecosystems.

5. How Water Is Managed

There are regulations and laws in place to manage and protect water resources as well as regulations that deal with the distribution of water. In addition, government instrumentalities have key responsibilities for administering these regulations and laws as well as delivering programs that meet public objectives for the management and delivery of water supply. This chapter describes the major Acts and institutions with key responsibilities in this area.

5.1 Legislation

The Water Resources Act (1997)

Since most of the Adelaide Hills and Adelaide Plains are not prescribed water resources under the Water Resources Act 1997, there are no licences pertaining to water rights in most of the Adelaide region. However, there are limitations on the size of farm dams that may be constructed in the reservoir catchments of the Adelaide Hills. In addition, there are three regions that are subject to formal regulation. They include the groundwater resources of the Northern Adelaide Plains and McLaren Vale regions, and the surface and groundwater resources of the Barossa Valley regions. For the Adelaide Plains and Adelaide Hills there are limited avenues for controlling farm dams, groundwater extraction and environmental water provisions from reservoirs.

To ensure the sustainable management of groundwater resources, they have been prescribed under the Water Resources Act 1997. Prescribing a water resource controls access to users with a water license or for stock and domestic purposes. Outside of the prescribed areas there is limited information about the usage and capability of the resources.

The Waterworks Act (1932)

While the prime objective of the Waterworks Act is to supply reticulated water throughout South Australia, it also empowers the SA Water Corporation (with the approval of the Minster for Administrative Services) to:

- Lessen or discontinue the supply of water when there is or is likely to be a reduction in the water available for mains supply
- Restrict the use of water for a specified purpose, in a specified manner or during specified periods

Recently the Waterworks Regulations were amended to impose permanent water use controls by restricting the way in which certain activities are carried out (eg. washing cars and hosing pavements) and the times at which certain activities can be carried out (eg. watering the garden). This represents a substantial shift in policy from earlier short term measures.

The Sewerage Act (1929)

This Act empowers the SA Water Corporation to construct and operate sewerage systems. Sewerage services provided by SA Water cover metropolitan Adelaide and 17 country centres.

The Environment Protection Act (1993)

The Environment Protection Act 1993 is the primary pollution control and prevention legislation in South Australia. It promotes the principles of ecologically sustainable development. The Act provides for the standards of care for industry and the community to safeguard the State's air, water, land and ecosystems.

The Act protects water quality by controlling the waste discharges that may have an impact on water quality in streams, rivers, coastal waters or groundwater. Significant discharges to water environments are controlled by the EPA via a licensing system. The licences control the kind, and volume, of pollutant allowed to be released into the waterway.

The EPA administers the Environment Protection (Water Quality) Policy 2003 that aims to protect South Australia’s waters from pollutants 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 reduction and/or better use of wastewater
- Promoting best practice environmental management
- Promoting environmental responsibility and involvement in environmental issues within the community
- Setting discharge limits for particular activities

The Development Act (1993)

The Development Act 1993 and associated regulations set the legislative framework for new development in South Australia. The Development system has three tiers – the Planning Strategy, Development Plans and development assessment, where development applications are assessed against each council's Development Plan, which in turn must be in keeping with the Planning Strategy. Development Plans define the parameters for development at the zone, subdivision and single block level.

The integrated planning and development assessment system is designed to meet the needs of both State and Local government, with input from the community, to plan ahead so as to:

- Provide people wanting to undertake development with a reasonable degree of certainty
- Ensure that infrastructure is provided in a planned and orderly manner
- Clearly set out the desired characters for different parts of the State
- Provide the community with a clear understanding of the ground rules for development while protecting the environment

The Act establishes that the Premier is responsible for regularly reviewing the State Planning Strategy. The Strategy guides development of the State and provides direction on how land and resources, including water resources, are used in ways that are socially, economically and environmentally responsible. The Planning Strategy not only provides the basis for the development assessment policies in South Australia but it also:

- Sets priorities for State government action
- Provides greater certainty for developers and the community
- Assists developers who are considering major developments

Local Government Act (1999)

The Local Government Act 1999 sets out functions for Councils which are empowering and not obligatory and that include a capacity to provide water and wastewater services, take measures to mitigate against flooding and to manage and protect the environment. The Act also sets out prescribed arrangements related to the way that Councils can raise service charges and rates in relation to the provision of water or wastewater (STED) services. In addition it contains powers for Councils in relation to acting in flooding emergency situations.

The Local Government Act 1934 sets out powers and prescribed processes in relation to councils establishing STED schemes.

5.2 Organisations Responsible for Water Management

The Government has given several organisations key roles in influencing the efficiency and sustainability of our water resources.
A summary of the key responsibilities of the major institutions considered to have a substantial influence on the delivery of water services in the Adelaide region are shown below.

SA Water is the largest Government enterprise in South Australia with responsibility for assets worth about $6 billion, more than half of which are in the metropolitan area. Its functions include:

- Water supply
- Water treatment to meet drinking water quality guidelines
- Reservoir management
- Collection, transfer and treatment of wastewater
- Billing and customer advice
- Policy advice to Government
- Lead water quality management and technology

While the assets remain in public ownership, the Government has contracted out the operation of its metropolitan water and wastewater services to United Water until 2011.

The Environment Protection Authority (EPA) is South Australia's primary environmental regulator charged with exercising the powers, functions and duties of the Environment Protection Act 1993.

The EPA delivers environment protection and advice in the areas of air, water, waste, noise and radiation.

In partnership with the community, industry and governments, the EPA provides leadership to protect and enhance the environment. It delivers environment protection, service and advice in:

- Water quality
- Waste minimisation, transport, treatment and disposal
- Site contamination and hazardous waste management and rehabilitation
- Protection and restoration of the riverine environments
- Environmental planning and assessment

The Department of Water, Land and Biodiversity Conservation’s (DWLBC) aim is to ensure South Australia's natural resources are managed in ecologically sustainable ways that support the well being of present and future generations.

The Department contributes to water resource management by:

- Improving the condition of our biodiversity, water, land and marine resources
- Wise resource use providing for best environmental, social and economic outcomes
- Improving the capability and willingness to invest in sustainable natural resource management
- The provision of natural resource planning, policy and scientific services

DWLBC ensures the allocation and the use of water resources occurs in a sustainable way according to ecologically sustainable development principles. It also ensures resources are not degraded by inappropriate management practices and introduced pests.

The Department for Environment and Heritage has a key advocacy and engagement role across Government, business and community throughout South Australia. It aims to achieve:

- Wise resource allocation and use
- Clean and healthy environments
- Conserved and functioning ecosystems
- Conserved and celebrated heritage
- Improved condition of our air, land, water and biodiversity
- A society actively engaged in the environment

Catchment Water Management Boards (CWMBs) have three main legislative functions under the Water Resources Act 1997 – to prepare and implement a Catchment Water Management Plan (and, where relevant, water allocation plans), provide advice to the Minister of Environment and Conservation, and Local Government about water resource management, and promote awareness and involvement in best practice water management.

Boards operate in collaboration with other agencies, councils and the community. There are four CWMBs in the Adelaide region – the Northern Adelaide and Barossa, Torrens, Patawalonga and Onkaparinga. The main activities of the Boards include:

- Water (both surface and groundwater) quality improvement programs
- Rehabilitation of waterways
- Community education and involvement programs
- Industry and community stormwater pollution prevention programs
- Promotion of sustainable water use

Natural Resource Management Boards are intended to combine the functions of CWMBs, animal and plant control boards, soil conservation boards and regional groups. These proposed Boards will service their own local community and have their own regional natural resource management (NRM) plans. They will be responsible for regional NRM planning and investment, delivery and decision making.

Local government has a key role to play in water management, particularly in stormwater drainage since its activities directly impact on urban water courses. Councils' legislative responsibilities include planning and development services, such as building assessment, and some environmental health services such as monitoring cooling towers for Legionnaire's Disease.

Other services provided and activities undertaken or funded by councils that affect water include:

- Local roads, footpaths and stormwater drainage
- Parks, gardens, reserves, wetlands, swimming pools and other public facilities
- Rubbish collection and disposal as well as recycling
- Economic development
- Monitoring of sanitary conditions
- Landcare, Coastcare and Dunecare programs and projects
- Septic tank effluent disposal schemes

Planning SA is responsible for the metropolitan planning strategy, proposed inner region planning strategy, planning amendment reviews, development applications, subdivision control and stormwater control.

The metropolitan volume of the Planning Strategy is currently being revised in accordance with ecologically sustainable development principles. One of the three main objectives of the revised draft is integration of water use and land use planning incorporating a whole of water cycle approach.

The Development Act sets out the procedures to be followed when preparing policy amendments to the Development Plan, including the separate processes for Council and Ministerial amendments. Councils are required to regularly review the policies in the Development Plan for their area in order to ensure that the policies are pertinent and consistent with the Planning Strategy. Councils are also encouraged to prepare local planning strategies so that they can become actively involved in the promotion of the agreed policies.

Development applications are judged against the policies set out in the Development Plan for each council area and the Building Rules. New development provides an opportunity to use the best available technology and measures to create more ecologically sustainable urban forms over time.

The results of the Water Proofing Adelaide study will be incorporated into the Planning Strategy.

6. Future Management of Adelaide's Water – Supply and Demand

6.1 Influencing Factors

COAG Water Reform

In recognition of the need for action to arrest widespread natural resources degradation, the Council of Australian Governments (COAG) agreed in February 1994 to pursue a range of important water reforms in Australia. These reforms cover areas including:

- Improved public consultation
- Pricing (including the treatment of cross-subsidies)
- More rigorous approaches to future investment
- Trading in water entitlements
- Natural resource management
- Institutional reform

South Australia recommitted to the COAG strategic framework in August 2003.

Supply and Demand

Adelaide's ability to rely on existing water supply sources to meet customer demand is influenced by many factors. Small changes in population and consumption growth rates can have a major impact on the lifespan of existing water resources. Some degree of prudence is needed when making decisions based on demand and supply projections.

Economic Efficiency

The water industry is one of Australia's largest industries, with assets estimated to be of similar magnitude to those of the electricity, telecommunications and airlines sectors. The provision of water and wastewater services to Adelaide costs consumers hundreds of millions of dollars each year. In addition, more than $30 million is spent by Government on water management-related activities and about $12 million by councils on stormwater infrastructure. Private expenditure on water-related services is also understood to be substantial.

As such, any improvements in efficiency we can make may lead to significant economic gains.

Technology

There have been significant technological advances in water treatment over the past decade. These advances may soon make the use of previously unusable water, such as water of higher salinity, sewage and stormwater, a practical and commercial reality.

Climate Change

A future threat to Adelaide's water supply is the potential for lower rainfall and higher evaporation rates as a result of climate change. Current studies suggest climate change is likely to result in a reduction in average rainfall in and around Adelaide of between 35 and 105 mm per year. In the worst case this could result in as much as 17,000 ML per year less flowing into reservoirs across the Adelaide region. Climate change may also significantly reduce the future supplies from the River Murray.

The CSIRO Climate Change in South Australia Report (2003) indicates climate change could have a major impact on water availability in South Australia and we need to plan for a range of possible climate change impacts. We need to consider the extent to which our solutions may compound the climate change impacts we are already facing and aim to minimise further production of greenhouse gasses.

Water Quality

A central issue in the future of water resource management is the quality of water required for different uses. While the community expects a high-quality potable mains supply from indoor household taps, a large number of people appear ready to accept water of lesser quality for uses such as toilet flushing and garden use if the risk to public health is not compromised.

Public Health

In some cities around the world, water supply contamination has resulted in public health being threatened and lives lost. The protection of the public against the risk of contamination of the water supply will be a paramount consideration in planning for Adelaide's future water supply.

Sustainability

It is recognised internationally that the world's resources are being consumed faster than they can be replenished naturally. The capacity of ecosystems to continue to supply and purify basic life support systems, such as water and air, is limited.

Although sustainability originated from this concern for the natural environment, current thinking emphasises the need to maximise the interdependencies between environmental, social and economic factors. From a water industry perspective, achieving sustainability requires:

- Understanding the balance between all parts of the water cycle
- Reducing per capita consumption of freshwater sources to provide for future growth and environmental demands
- Identifying public health and environmental risks associated with increased water recycling and decentralised treatment
- Securing water supply systems that can handle demand variability
- Reducing energy use and therefore greenhouse gases in the process
- Educating the community on the long-term environmental impacts from contaminants
- Reducing waste
- Achieving cost effectiveness

Existing Infrastructure

Over a period of more than 150 years South Australians have established multi-billion dollar assets in the form of water distribution, sewage and stormwater management systems. Most of these systems still have a long use life and spare capacity to cope with population growth. While our thinking should not be totally constrained by the past, these assets are a very real and significant consideration in planning for the future.

6.2 Determining a Mix of Options for Metropolitan Adelaide

The following section explores a range of water management options, some of which may form part of a final strategy. More detailed information on these options is available from Water Proofing Adelaide (contact details in section 9) or see the Water Proofing Adelaide website www.waterproofingadelaide.sa.gov.au

The factors described in section 6.1 must be taken into account when considering the options for influencing optimal management, conservation and development of Adelaide's water supplies. It is unlikely a single option will meet our needs and instead, we are likely to have to incorporate a mix of different options. The options examined so far fall into four broad categories:

1. Reducing water use
2. Better management of our existing water systems
3. Development of new or alternate supplies (eg stormwater or wastewater reuse)
4. A combination of the above three

7. Options For Adelaide's Future

7.1 Reducing Water Use

Reducing Demand through Education and Promotion

Educating consumers about their own household consumption is important in achieving consistent water conservation behaviour. The promotion of water efficient gardens through competitions and demonstrations as well as the adoption of good garden practices, such as mulching and efficient watering techniques, can influence how gardens are designed and managed.

Seeking Your Feedback

- Are you aware of the educational and promotional programs in place?
- How effective are they in encouraging you to save water?
- How could these programs be made more effective?
- Can you suggest any other means of education and promotion that could be more effective?

Demand Management Options at a Household Level

There is a range of options that could be used to reduce consumption of water at a household or local level.

Water-Efficient Appliances

Common appliances are widely available that can save water for the householder and potentially make a difference to Adelaide's total water use. The table below shows the relative cost saving to the householder per kilolitre of water saved. In some cases (eg low flow shower head and water efficient washing machines) there will also be significant savings in power costs associated with water heating. Included in the table are estimates of the total potential water savings across Adelaide through the introduction of each appliance, acknowledging that there has already been a high degree of uptake of some of these (eg dual flush toilets).

Appliance	Potential reduction in Adelaide's total water use (GL/yr) (based on 100% uptake)	Estimated cost / savings to the consumer (per kL) (based on $1.03/kL cost of water)
Water efficient washing machines	6.7	$0.25 cost[1]
Tap timers	3.9	$0.50 – $0.80 saving
Low flow showerheads	3.3	$0.00 – $0.50 saving
Low flow taps	1.6	$0.06 saving
Dual flush toilets	3.2[2]	$0.00 – $1.50 cost
Replace existing gardens with native gardens & use water efficient garden practices	30.0	$0.05 saving – $0.75 cost

1. If energy savings are taken into account, use of water efficient washing machines can result in a net saving to the consumer
2. An extra 2 GL per year saving from dual flush toilets could be achieved through widespread takeup of newer, more efficient low flow toilets.

Governments in Australia and New Zealand are developing a national Water Efficiency Labeling Scheme (WELS) to require the mandatory labeling of some domestic water-using appliances with their water-use efficiency. Initially, shower heads, toilets, dishwashers and washing machines will be labeled, with extension to other appliances at a later date. Label information will allow consumers to be more informed on the running costs of appliances and offset these against increased initial cost (if any). Consideration may be given in the future to a prohibition on the sale or installation of appliances with poor water efficiency, as is already the case for toilet cisterns.

Seeking Your Feedback

- How do you feel about the Government mandating the use of water efficient appliances?

Savings in Commercial and Industrial Use

Many businesses have already improved water use efficiency and are finding the savings in water costs outweigh the cost of the improvements. However, it is still possible to save more. By installing water saving equipment such as low flow taps and trigger hoses, coupled with education in the workplace regarding wise water use, it is estimated that at least a further 1000 ML per year can be saved.

A water audit is the best way of identifying wastage while further savings can be realised by considering water use when upgrading plant and machinery in the future.

Savings in Irrigation of Public Reserves, Sportsgrounds and Schools

Many councils and schools have installed water efficient irrigation systems. Automation and optimisation of systems as well as climate-based scheduling promotes lower water use. In many cases, the costs of upgrades can be recouped through savings in water and labour cost. Water savings of up to 2,500 ML per year by 2025 are forecast due to watering efficiency improvements.

Reducing Demand through Pricing Changes

Volumetric charging for mains water in South Australia was introduced in 1995. This was a major change in the pricing structure and it appears it led to a reduction in household demand. However, with gradual population growth, overall consumption has continued to increase. The impacts of the 1995 price changes suggest very radical changes in pricing would be needed to significantly impact on demand.

The current residential price for mains water comprises:

- A quarterly access charge of $35.25
- $0.44 per kL for the first 125 kL used in the year
- $1.03 per kL above 125 kL over the year

In addition, levies have been imposed through council rates to fund local catchment management programs and more recently through SA Water's billing system to fund the River Murray rescue program agreed to by COAG.

Water pricing policy is complex. Some believe the cost of water is already too high while others contend that it should be higher to encourage the use of alternative sources. There are those who believe a higher fixed charge should apply to more accurately reflect the cost of the water supply infrastructure while others believe a lower fixed charge and higher use charge are more appropriate to discourage overuse of water. Other options that have been proposed include:

- Step tariffs, whereby the cost per kL increases in step with increased consumption. This may involve more than the current two steps and could be used to target high consumption water users.
- Seasonal water charges which increase the cost of water in summer when demand is high to encourage more water efficient use in gardens and for other outdoor uses.
- Annual charging which is an alternative form of seasonal charge. Through this form of charging the cost of water varies each year according to how much is available from the Hills reservoirs or the River Murray – much the same way as fruit and vegetable prices change according to the success of the season. This way water saving would be encouraged more in dry and drought years than in wet years.
- Peak hour tariffs which use telecommunications technology to read water meters remotely, recording use at more frequent intervals and enabling pricing to reflect demands at peak times.
- Changing the information customers receive about pricing. Water accounts currently show water use comparisons for the same property over corresponding period in the previous few years. They could possibly tell customers how their annual usage compares with other similar-sized properties or households with the same number of occupants.

It needs to be remembered that some of the above options may not be feasible without expensive modifications to metering systems or the way meters are read. Alternatively, they may require collection of more information about individual customers. Some options may also have significant unintended social consequences and would probably have more severe impacts on those least able to pay.

Seeking Your Feedback

- Should pricing be used to manipulate demand? If so, how?
- If price is used to regulate demand, then how should we deal with the burden imposed on low income earners, charitable organisations etc?
- What extra information would be useful on your water bill?
- What other ways are there to use price incentives to encourage water conservation?

Reducing Demand through Incentives

The South Australian Government is offering rebates for water-efficient showerheads, flow restrictors and garden tap timers.

Other states have offered incentives for the purchase of AAAA-rated washing machines and rainwater tanks plumbed into the laundry or toilet. Though such incentives come at a cost to the community which is not necessarily recovered through the savings made.

It may be possible to provide incentives to homes or businesses that can demonstrate significant reductions in water use though such schemes would probably be difficult to administer. The benefits of incentive schemes may not always be sufficient to justify the costs and some forms of incentive may also favour some consumers over others so caution needs to be exercised with any such scheme.

Seeking Your Feedback

- What type of incentives would be attractive to you?
- Are there any particular customers more deserving of incentives?
- What sort of products and services should be targeted with incentives?
- How should incentives be funded and should the funding be directly related to the amount of water saved?

Reducing Demand through Regulation

Mandatory regulation can be effective in quickly reducing water demand but there are important consequences to be considered before introducing more regulation, including whether or not the benefits justify the cost. Regulation produces its own challenges for enforcement. Careful thought must be given to the level of penalties and the evidence needed for successful prosecution.

Recent market research suggests some people see regulation as a fairer way of achieving water savings because everyone has to contribute, not only community-minded citizens. Others though disagree saying that regulation, with its necessary compliance monitoring programs, can be an inefficient way of reducing consumption.

A good example in South Australia is the regulation in the mid-1980s that made dual flush toilets compulsory in all new homes and when-ever old toilets were replaced. As a result, the amount of water used for toilet flushing is estimated to have since declined by about 45%.

Other regulatory options may be explored such as: making low flow shower heads compulsory; requiring new homes to have rainwater tanks; setting a minimum water efficiency rating for new washing machines; requiring tap timers in the garden or the professional design of automatic sprinkler systems. For sporting and parkland areas, rain sensors to over-ride automatic watering systems and soil moisture sensitive control systems are also possible options.

Another example is the recent Government initiative to permanently ban the use of sprinklers during certain times of the day. It is estimated that this conservation measure will reduce mains water use by about 6000 ML, or approximately 3%, per year.

Seeking Your Feedback

- What type of regulation do you believe would reduce the consumption of water?
- What forms of regulation would you not support?
- Do you support the use of water saving targets to encourage water conservation?
- What percentage level of water saving do you believe that you could realistically achieve if you had to cut down on your use?

7.2 Better Management of Existing Water Systems

There is a range of potential actions that can be undertaken within the existing supply system that would effectively increase the amount of available water. These range from changes in the means of delivering water through to incremental improvements to increase the available yield of existing catchments.

Reduce Losses from Existing System

In a vast network of pipes incorporating hundreds of thousands of connections, there will always be some leakage. Unfortunately, there is also theft of water from illegal connections and illegal use of fire services. By both national and international standards Adelaide's water supply system has very low levels of leakage. It is not possible or economically viable to trace and correct every instance of such losses but some savings may be possible.

About 14 GL of mains water is unmetered each year. Much of this is used for fire fighting, system maintenance and other legitimate purposes but theft and leakage also make up a significant amount. Leaks can be very difficult to detect and in some cases, the costs may outweigh the benefits.

Preliminary estimates indicate that expenditure of $10 - $20m may be required to recover about 3 GL of losses. Work is currently being undertaken in a pilot area to determine the real costs and benefits of such actions. There may also be opportunities to reduce the amount of water lost in system maintenance programs such as mains flushing.

Several sections of the mains water system receive higher water pressure than others. By reducing the pressure in these areas, leakage may also be reduced.

Increase Yield from Existing Water Resources

There is potential to collect much more water from current sources and many of the options investigated are listed in the table below. Some options are clearly uneconomic or could have major social or environmental impacts and, for these reasons, are unlikely to be acceptable.

Figure 7.2a
Variability of options to increasing supply from existing sources

Option Group	Option	Estimated available water per year	Estimated capital cost	Estimated annual operating / maintenance cost	Estimated cost to consumers[1] (cf Current supply cost of $1.03/kL)
Increase available water from the River Murray	Purchase additional River Murray allocation from lower value users	Up to 25GL 25 to 40GL 40 to 80GL	$33m $115m $230m } including allowance for future capacity upgrades	$0.3m $0.8m $1.25m	$1.10 /kL $1.20 /kL $1.30 /kl
Increase the volume of water captured by the reservoirs	Increase the height of existing reservoir walls	up to 3.6 GL	$50m	$0.25m	$2.20 /kL
	Reduce minimum reservoir operating levels[2]	Up to 12 GL	$4.5m	$0.65m	$1.00 /kL
	Pump from River Murray to reduce spill and evaporation[3]	up to 3 GL	$Nil	$0.63m	$1.00 /kL
Reduce evaporative losses from reservoirs	Cover reservoirs – lime and alcohol product	up to 3 GL	$Nil	$1.9m	$1.40 /kL
	Cover reservoirs – floating cover	up to 7 GL	$290m	$1.5m	$5.00 /kL
Reduce losses from aqueducts	Pipelines to replace aqueducts	up to 3.5 GL	$60m	$0.6m	$2.60 /kL
Manage development competition in the Mount Lofty Ranges	Prescribe Mount Lofty Ranges Water Resources	3 GL (not lost to reservoirs from farm dams or groundwater flows)	$13 million	$2.2m	$1.70 /kL

1. Costs to consumers are notional costs of water from that source only and are inclusive of treatment and distributions costs to allow comparison with current supply cost of $1.03/kL
2. SA Water currently maintains about three months' supply in its reservoirs for security purposes. Reducing operating levels makes more water available but reduces security in the event of an emergency or state disaster.
3. SA Water currently pumps from the River Murray with the aim of maintaining a high level of security of supply. This means that on occasions more water is pumped than is needed. By pumping only on demand, some losses can be avoided but it also reduces our security in the event of a pipe or pumping station failure, which can take days or even weeks to repair.

Over time other ideas including clearing and sealing all of the Adelaide Hills catchments, cloud seeding and using offshore wind turbines to increase evaporation and thus rainfall have all been proposed. The first two of these though would have extreme negative environmental and social impacts while the third would be extremely expensive and unlikely to produce enough water to meet even 1% of Adelaide's water needs.

Water Quality Issues

The quality of Adelaide's raw water sources is poor in comparison with other state capital cities. This is particularly true in terms of aesthetic indicators such as turbidity, colour, salinity and hardness. This is due to natural factors and Adelaide's water supply catchments being shared with other uses such as agriculture.

Extensive water treatment processes are required to ensure the community receives a reliable water supply that meets national guidelines.
A comprehensive preventative strategy from catchment to consumer is required to maintain and potentially improve water quality.

Catchment management and source water protection provide the first and arguably most important mechanism in this process. Preventative measures include:

- Controlling land use
- Protection of waterways (eg fencing out livestock, erosion, management)
- Use of industry codes of practices and best practice management
- Regulation of wastewater treatment and disposal systems

7.3 Possible Alternative Water Supplies

Many alternative water supplies have been suggested over the years. Although theoretically feasible, many of these options are uneconomic or may have major social or environmental impacts.

Encouraging Use of Recycled Wastewater

Increased use of stormwater and wastewater has the potential to reduce pressure on traditional sources of water. Experience has shown that use of stormwater and wastewater is more cost effective and straightforward in new developments than when retro-fitting existing infrastructure but can still be expensive. Health impacts and the associated risks and costs also need to be considered.

Wastewater from Wastewater Treatment Plants

Adelaide already reuses nearly 20% of its treated wastewater, which is a far higher percentage than most other cities. The Virginia Pipeline Scheme north of Adelaide is one of the largest wastewater reuse schemes in the Southern Hemisphere and is designed to supply more than 20,000 ML to local market gardeners and other irrigators.

There may be other opportunities to increase wastewater reuse further by investigating projects that could be undertaken by Government and / or the private sector. Treating wastewater to a standard suitable for reuse is expensive as are the pipeline systems needed to transport the water. Wastewater reuse, therefore, lends itself better to large projects where economies of scale can be gained. The opportunity here is for reuse of wastewater to reduce demand on existing supplies rather than as an extra supply for other uses.

Sewer Mining

Smaller scale opportunities include sewer mining schemes which tap into the underground sewerage network. This involves a compact treatment plant that collects a small proportion of the effluent. It has the benefit of reducing the overall load on the network and provides non-potable quality water where needed, however this water may also be treated for potable supplies in the future.

Encouraging the use of sewer mining may require establishing rules and obligations on the potential user as well as the institution responsible for managing the sewerage service to ensure community interests are best served.

Greywater

Greywater is household wastewater, such as shower or laundry effluent, that has not come into contact with toilet wastewater ('blackwater'). With some onsite treatment, greywater is a potential source for garden use and toilet flush water. However, treatment can be costly and difficult to implement and maintain. There are rules in place regarding the installation and maintenance of greywater systems which are designed to protect health, water supply and local amenity. Approval to install a greywater system must be obtained and an application fee applies. It is estimated only about 0.6 GL of greywater reuse is achievable each year in total, at a relatively high cost to consumers.

Encouraging the Harnessing of Local Water

Rainwater tanks are a useful option for providing additional water to property owners. While many people use rainwater tanks for drinking purposes, it should be noted that water from rainwater tanks rarely meets Australian drinking water guidelines and can potentially be a source of water borne illness.

To make any significant difference to the overall supply for Adelaide, rainwater tanks would need to be plumbed extensively across many households into high water use sections of the home such as the toilet and laundry.

In most cases, a pressure pump would be required and it is illegal to plumb rainwater into the house systems without first installing an approved backflow prevention device to stop tank water from contaminating the mains water supply. If tanks are not properly maintained mosquitoes may also become a problem in some areas.

Rainwater tanks can have some impact in reducing urban flooding, however this requires a large number of houses in a region to both own and regularly use their tanks.

To install 5 kL rainwater tanks in all new properties and have them plumbed into the house would cost home builders about $2000. Fitting to existing dwellings is likely to be more expensive.

Urban Stormwater

Stormwater management encompasses a range of objectives including flood mitigation, minimising pollution discharge and value adding by identifying incentives for on-property or downstream re-use. While this suggests stormwater management raises a complex set of issues, there are mutually beneficial potential outcomes to be achieved from promoting stormwater capture and use.

There are very successful stormwater reuse schemes in Adelaide and it is estimated up to 5 GL of stormwater is now captured and used for irrigation or industry. Each scheme has been specifically designed to meet one or more objectives. Since current stormwater reuse schemes do not meet drinking water guidelines, a major hurdle can be finding customers willing to purchase non-potable water. This may change in the future with new technology and uses becoming available.

Most of Adelaide's stormwater infrastructure has been designed with a focus on flood protection rather than economic use of the water. If we want to reuse greater quantities of stormwater we need to change the way our drainage and stormwater infrastructure is designed, built and managed.

The biggest hurdles to stormwater reuse are:

- The huge variability in quality (first flush water after a long dry period contains much higher levels of contaminants than flows at the end of a long period of rain)
- The ability to capture and treat large quantities of stormwater in a short period of time
- The ability to store very large volumes of water in winter and recover it in summer when most use occurs
- Accessing customers near the storage areas who are willing to take non-potable water

- The cost of schemes where stormwater reuse is the only aim (where there are flood mitigation benefits the schemes become more viable)

Given these difficulties, there appears to be scope for several future schemes capturing comparatively small (up to 500 ML) volumes of water, especially in developing suburbs.

Treating stormwater for potable reuse is possible but difficult and has potential health risks

Taking the initiative

New Brompton Estate Urban Re-Development Project

The New Brompton Estate Roof Runoff Management scheme was commissioned in 1991. The on-site retention system was developed and designed by the University of South Australia and received support from the (former) Department of Environment and Planning (DEP). The scheme collects all roof runoff from adjacent cluster-housing dwellings, which is diverted into a collective trench-ASR scheme. The system is unobtrusive and use is made of the reserve for recreation. Ninety-eight percent of runoff is captured and retained on-site.

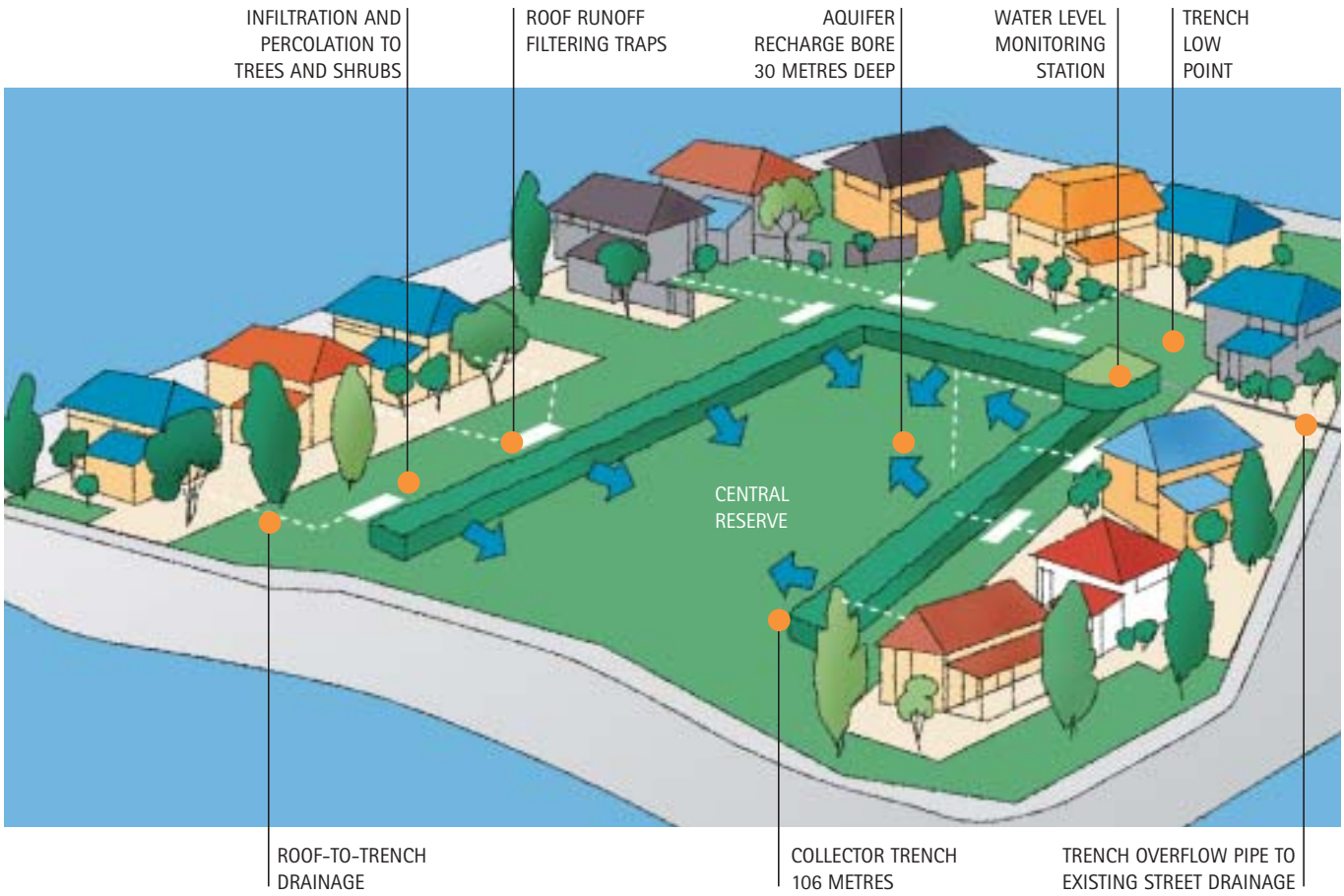

Figure 7.3a
Recharge system at New Brompton Estate, City of Charles Sturt, Adelaide
Urban Water Resources Centre, University of SA

Seeking Your Feedback

- What are your views on reuse of treated wastewater and stormwater?
- How could greater use be made of these sources?
- What are the impediments to greater reuse?

Desalination

In the past 20 years desalination of either brackish groundwater or seawater has become a much more feasible option. Groundwater is desalinated for potable use in Coober Pedy and seawater is desalinated for the town supply at Penneshaw on Kangaroo Island. There are also plans to desalinate brackish water from the Todd Reservoir on the Eyre Peninsula for use in the Peninsula's mains water system. In addition, industries requiring very pure water sometimes use desalination processes to treat poor quality ground water or even mains water.

The main desalination processes are reverse osmosis – where saline water is forced at very high pressures through membranes that act as filters retaining salt molecules – and distillation. Both processes are very power intensive requiring about 5 kilowatt hours of power (the equivalent of 120 40Watt light bulbs burning for 1 hour) to produce 1 kL of water. This means that unless renewable forms of energy can be found, the greenhouse gas effects of a large scale desalination plant would be significant.

For the moment large scale desalination is probably too expensive and would contribute too much to the State's greenhouse gas emissions. Developments in desalination technology or power generation technology will determine its future viability.

Taking the initiative

Desalination at Penneshaw

An emerging and exciting development is the advance in reducing the costs of desalination technology. Several South Australian outback towns have been using desalination for water supply for some years. SA Water recently commissioned a new plant at Penneshaw, Kangaroo Island, to supplant the local supply.
Seawater is utilised and rejected brine water can be discharged back to the sea. Desalination has potential in South Australian regional communities that have limited access to local supply sources and where local water resources are under stress.

Other Options

In addition to the options discussed above, various studies from as far back as the early part of the 20th century have identified possible water sources. They included collecting additional water from existing catchments, more pipelines from the River Murray and receiving water from other sources.

Any decision to secure additional sources should only be made after undertaking thorough environmental impact assessments, extensive community consultation and detailed planning.

Option	Estimated available water per year	Estimated capital cost	Estimated annual operating/ maintenance cost	Estimated cost of water to consumers[1]
New reservoirs in the Adelaide Hills	Up to 12.7 GL	$120 million	$1.7m	$1.80 /kL
Seawater or saline groundwater desalination	Unlimited (Estimates based on 50 GL)	$340m	$39m	$2.20 /kL
Greywater reuse	0.6 GL	$35m	$0.6m	$6.40 /kL
Household rainwater storage	25 GL	$900m	$0.3m	$5.60 /kL
Local groundwater	3 GL	$2.4m	$0.84m	$1.10 /kL
Wastewater (non-potable use only)	Up to 30 GL (of which nearly 20 GL is already used. More is available but at higher costs)	Variable depending on site	Variable depending on site	$1.00 - $2.00 /kL.
Stormwater (non-potable use only)	10 GL (more is available but at higher costs)			$0.50 - $1.50 /kL
Groundwater and / or surface water from the South East of South Australia	110 GL	$2.5 billion	$100m	$3.90 /kL
Transfer from Northern Western Australia, Queensland or Northern New South Wales	Up to 200 GL	$2.5b - $10b depending on scheme	Varies depending on scheme	$6.00 - $9.00/kL
Harvest icebergs	4.2 GL (practical limit)	$660m	$16m	$19.00 /kL

Figure 7.2b
Options to increase water supply from new sources

1 Costs to consumers are notional costs of water from that source only and are inclusive of treatment and distributions costs to allow comparison with current supply cost of $1.03 /kL

The last three options have effectively been discounted due to various combinations of cost, environmental issues, social considerations and impacts on local industry and logistics.

7.4 Effective and Efficient Regulatory Arrangements

The effectiveness and efficiency of regulations and laws that deal with the management, protection and distribution of our water resources will be considered as part of the Water Proofing Adelaide project only if they influence supply and demand scenarios. Similarly, governance issues and the responsibilities of those institutions administering water may be considered. Issues that may have an impact on the outcomes include:

- The determination of environmental flows for urban and peri-urban streams
- Effective instruments that resolve conflicts and can influence the outcomes towards the agreed community direction
- The frameworks or mechanisms for understanding and allocating risks and effective delegation of decision making when they arise
- The structure and regulatory regime in which institutions operate to encourage effective decisions that meet overall public interest objectives
- Allocation and pricing of water resources
- Appropriate plumbing regulations
- The availability of good information about the water, infrastructure or programs that enable effective decision making

Seeking Your Feedback

- Are the current regulatory frameworks for water management in Adelaide and SA encouraging or hindering best practice water management?
- Can further changes be made to improve customer services?
- Are we allocating sufficient water to the environment?
- Are we effectively balancing between competing water uses, particularly between urban supply, and agricultural uses of water?
- Are there any other regulatory or policy issues that you consider important?

8. Future Planning and Management Issues

As we have seen, there is a broad range of supply and demand management options available to Adelaide. To identify, develop and implement the correct strategy requires assessment of each option in view of the future directions and priorities for Adelaide.

Consideration of the sustainability of the options, requirements to protect the water quality and its allocation to meet competing needs is fundamental to the development of a long-term strategy.

8.1 The Role of the Community

The community as a whole, or targeted sectors therein, are often called on to be involved in deciding public policy. Models of community involvement have ranged from very limited input to extensive debate and involvement.

The Water Proofing Adelaide project needs the input of individuals, community groups, businesses, industry associations, interest groups and government agencies to formulate a strategy on managing Adelaide water into the future.

Seeking Your Feedback

- What ongoing role should the community play in decision making processes?
- How do you see that role being undertaken?

8.2 Achieving Sustainability

The notion of sustainability challenges all South Australians to consider the social, environmental and economic impact of future water supply options.

Decisions based only on economic considerations sometimes lead to significant environmental or social costs. The need to secure Adelaide's water supply while ensuring social equity and protecting the health of the vital ecosystems provides the single most significant challenge facing the community.

It is unlikely a single solution will be found that achieves the multitude of outcomes linked to sustainability. At every stage in evaluating the options, consideration must be given to the kind of economic system and community we want to create. This will ensure we are moving in the right direction for both short and long-term prosperity.

Seeking Your Feedback

- What does the concept of sustainability mean to you?

9. Where To From Here

Next Steps

The aim of this Discussion Starter is to:

- Promote community discussion on the key issues
- Provide effective basic information to improve community awareness and understanding of the key issues
- Encourage public submissions to the Strategy Committee
- Discover other potentially significant issues that need to be considered
- Foster good ideas

9.1 How to get involved

This Discussion Starter is an invitation for people to take part in discussions and debate about how we are going to manage our water for the next 20 years.

Your thoughts and opinions will form an important step in deciding the future of water management for Adelaide.

You are invited to provide your ideas and feedback via the website or you may wish to prepare a written submission and send it to us. You can also call us on 1300 364 422 for the cost of a local call.

We will be holding public meetings in Adelaide and the surrounding areas. These meetings will be publicised in the local papers and on our website.

Address:
Water Proofing Adelaide
GPO Box 1751
ADELAIDE SA 5001

Phone: 1300 365 422
Email: waterproofingadelaide@sawater.com.au
Website: www.waterproofingadelaide.sa.gov.au

There is no set formula, length or format required of you. All we ask is that you develop and present your ideas and views with a close eye on all or some of the questions contained in the boxes throughout the Discussion Starter. Unless you indicate otherwise, all submissions will be posted on the dedicated website. You may wish to check this website throughout the development of the strategy.

Appendix I
Water Proofing Adelaide

Committee and Project Team Membership

Heads of Agency

Steering Committee

Mr Rob Freeman
(Committee Chairman)
Chief Executive,
Department of Water, Land
and Biodiversity Conservation

Ms Kathryn Bellette
Divisional Director, Strategy
and Projects, Planning SA

Ms Christine Bierbaum
Executive Director,
State Infrastructure,
Department for Business
Manufacturing and Trade

Dr Paul Grimes
Deputy Under Treasurer,
Department of Treasury
and Finance

Ms Anne Harvey
Executive Director,
Office of Sustainability

Ms Anne Howe
Chief Executive,
SA Water Corporation

Strategy Advisory Committee

Dr Don Hopgood
(Committee Chairman)
Former State Deputy Premier
and Minister for Water Resourses

Professor Don Bursill
Cooperative Research Centre for
Water Quality and Treatment

Mr Graham Dooley
Australian Water Association (SA)

Mr Peter Cooper
Water Resources Council

A/Professor George Ganf
Cooperative Research Centre
for Freshwater Ecology

Mr Peter Moser
Business SA

Mr Alan Ockenden
Catchment Water
Management Boards

Mr Colin Pitman
Local Government Association

Ms Sharon Starick
SA Farmers Federation

Dr Keith Walker
South Australian Conservation
Council

Ms Rochelle Woodley-Baker
SA Council of Social Services

Project Team

Mr Steve Rose (Project Leader)
Mr Martin Allen
Ms Rachel Bishop
Ms Belinda Day
Mr Paul Doherty
Ms Trisha Drioli
Ms Natasha Hall
Mr Steven Kotz
Mr Sam LeRay
Mr Ed Pikusa
Ms Natalie Stalenberg
Mr Stephen Wills

Appendix II Water Proofing Adelaide

Terms of Reference and Management Arrangements

Background

The South Australian Government is preparing an integrated 20-year strategic water plan for Adelaide and its environs, to be known as Water Proofing Adelaide. The strategy is being prepared as a project under the joint direction of the Minister for Environment and Conservation and the Minister for Administrative Services. The strategy is to be completed by March 2005 and will set out a blueprint for the management, conservation and development of Adelaide's water resources to 2025.

Water Proofing Adelaide will include:

- An overview of Adelaide's water use including characteristics of the Adelaide region, current water resources, environmental impacts, water supply systems and the policy framework
- An assessment of existing demands, including water consumption patterns, and matching these demands with quality requirements
- Predictions of future yields, water quality and cost of providing water from existing traditional sources as well as from potentially new sources such as treated stormwater, wastewater and desalination
- Predictions of future demand and competition for use between horticulture, agriculture, urban supplies and allocations to the environment
- Risk assessment incorporating projected changes in water demand and water sources based on outcomes from forecasting exercises and scenario planning
- Options and strategies for achieving an optimum water balance including new water sources as well as regulatory, policy and management measures

Heads of Agencies Steering Committee (HoASC)

A Steering Committee has been established to oversee the development of the strategy. The HoASC has representation from SA Water, Department of Water, Land and Biodiversity Conservation, Department of Environment and Heritage, Planning SA, Department of Treasury and Finance and Office of Economic Development.

The HoASC will:

- Provide high level direction to and oversee the work of the Project Management Group
- Provide advice to the Government on how to manage water resources for metropolitan Adelaide and environs for the next 20 years to 2025

The principal focus will be the delivery to Government of a draft Water Proofing Adelaide strategy. Recommendations will be based on a 'triple bottom line' (economic, environmental, social) assessment of options.

Appendix II Water Proofing Adelaide

Recommendations will be made for policy, legislative and program changes which:

- More effectively allocate water between competing uses (urban, agricultural, environment)
- Improve service delivery at an appropriate cost to water consumers
- Encourage water conservation by water service providers
- Encourage water conservation by water users
- Encourage the uptake of efficient alternative water supplies such as treated stormwater and wastewater, roof runoff or desalinised seawater

The strategy may involve provision of interim advice and recommendations or on measures for implementation during the course of the project.

The strategy will involve providing advice and recommendations to the Ministers as appropriate on any matters associated with the proposed strategy and the conduct of the project. As such, the chairperson of each committee will need to regularly brief the Ministers on progress of the study.

The Strategy Advisory Committee

A community-based Strategy Advisory Committee (SAC) has been established by the Government to facilitate consultation on the strategy.

The SAC comprises an independent chair (former Minister for Water Resources, Dr Don Hopgood) and representation from:

- Business SA
- Local Government Association
- Council of Social Services
- SA Farmers Federation
- Catchment Water Management Boards
- Cooperative Research Centre for Freshwater Ecology
- Cooperative Research Centre for Water Quality and Treatment
- South Australian Conservation Council
- Water Resources Council
- Australian Water Association (SA)

The SAC will oversee broad consultation with the community and therefore will ensure that the community issues are addressed in the proposed strategy.

Appendix II
Water Proofing Adelaide
Time Frame

May – September 2003	Initial studies to verify likely future supply and demand scenarios. Preliminary work on options including those frequently raised by the community through the press and other forums. This work will serve to better educate team members and form the basis for development of a community Discussion Starter.
October 2003	Project Launch – Water Proofing Adelaide forum
November 2003	Commence community and industry meetings to discuss ideas. Release of Discussion Paper (January). The aim will be to ensure the community is made fully aware of the project and to actively engage people in discussion of the issues to be dealt with in the strategy.
June 2004	Draft of the proposed Water Proofing Adelaide strategy.
	Further analysis of future supply and demand scenarios will continue throughout this phase as will the development of options taking account of community and stakeholder response.
July – December 2004	Further community consultation on the draft, following Government consideration of the draft strategy.
March 2005	Final strategy delivered to Government

Appendix III
Glossary of Terms

Aquifers Underground sediments or fractured rock that hold water and allow water to flow through them.

Basin An area drained by a given stream and its tributaries.

Blackwater Wastewater from the toilet.

Bore A hole drilled to extract ground water.

Bulk water entitlements A legal right under the Water Act (1989) to harvest and use water.

Catchment An area of land draining rainfall into a river or reservoir.

Catchment yield The annual average volume of run-off from a catchment.

Demand management An approach that is used to reduce the consumption of water.

Desalination The process of removing dissolved salts from seawater (or brackish water) so that it becomes suitable for drinking or other uses.

Disinfection The use of chlorine or ultraviolet light to control harmful micro-organisms.

Diversion weir A small weir across a river or stream diverting water into a tunnel or pipeline.

Ecology The study of the inter-relationships between living organisms and their environment.

Environmental flow release Release from a water storage intended to maintain appropriate environmental conditions in a waterway.

Filtered water Water that has been passed through sand or membrane filters to remove impurities. Filtration is normally followed by disinfection.

Flow rate Volume of water per unit of time (e.g. kilolitres or megalitres per day).

Greywater Wastewater from the laundry, bathroom and kitchen.

Groundwater Sub-surface water, particularly that which is in aquifers.

Irrigation The application of water to cultivated land or open space to promote the growth of vegetation.

Potable water Water fit for human consumption.

Primary sewage treatment The first major stage of treatment of sewage, usually involving the removal of settleable solids.

Appendix III
Glossary of Terms

Retro-fitting Installation of fittings or appliances on existing buildings (e.g. dual flush toilets).

Run-off That part of precipitation which flows from a catchment area into streams, lakes, rivers or reservoirs.

Secondary sewage treatment After the removal of suspended solids in primary treatment, secondary treatment involves oxidising organic matter in the sewage by bacteria, and the resultant growth is then removed by settlement or filtration.

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.

Stream flow The flow in a stream or river.

System yield The annual level of total demand that can be supplied by a water supply system subject to an adopted set of operational rules and to a typical demand pattern while maintaining a given level of security of supply.

Tariff A system of charges for the provision of water supply.

Transfer/Distribution system A system of conduits (eg. 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 the major storage points – perhaps to smaller service reservoirs; these can then feed into smaller 'service' pipes which deliver the water to the customers.

Treated effluent The treated water discharged from a sewage treatment plant.

Unfiltered water Water harvested from uninhabited catchments and supplied without filtration but always disinfected.

Volumes Kilolitres (kL) = 1,000 litres (or 1 cubic metre)
Megalitres (ML) = 1,000,000 litres (or 1,000 cubic metres)

Water harvesting The process of collecting water run-off resulting from rainfall. This is undertaken primarily in protected catchments but is also used to describe the extraction of water from rivers or ground water.

Wastewater Contaminated water before it undergoes any form of treatment. The water may be contaminated with solids, chemicals or changes in temperature.

Water right The property right that individuals and organisations have in the water resource under law.

Appendix IV
Options currently being assessed

The following is a list of options that Water Proofing Adelaide is currently assessing. Other options may also arise.

We are examining options from an economic, environmental, social (including public health) and feasibility perspective.

Information sheets on each of the options, including a basic assessment are also being developed.

Agriculture demand management
Cloud seeding
Demand management
Desalination
Domestic Aquifer Storage and Recovery
Evaporation management
Garden water efficient devices
Great Artesian Basin
Greywater recycling
Groundwater use
Household water efficient devices
Icebergs
Increase storage in existing reservoirs
Increase use of River Murray
Industry demand management
Leakage reduction
Mount Lofty Ranges prescription
New dams
On-site wastewater treatment/reuse
Piping water from interstate
Rainwater tanks
Sealed catchments
Sewer mining
South East surface water or groundwater transfer
Stormwater use
Urban irrigation demand management
Wastewater reuse

Notes

Notes

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