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# Water Sensitive Urban Design Framework



*Greater Adelaide Region*



# Water Sensitive Urban Design Framework – Greater Adelaide Region

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# What is Water Sensitive Urban Design?

The South Australian Government is seeking to integrate Water Sensitive Urban Design (WSUD) into all urban developments and buildings in South Australia. This Framework is part of that process.

WSUD provides for the sustainable use and reuse of water within developments from various sources, including rainwater, stormwater, groundwater, mains water and wastewater (including greywater and blackwater). There are many different WSUD measures or tools which can be adopted, depending on the size and nature of the development or building and examples are provided in **Section 1.4** of this document. Residential, commercial and industrial developments and buildings can all apply WSUD measures.

As well as a range of technical measures, WSUD is a philosophy and methodology which, when applied to design and development, integrates the complete urban water cycle within urban development. A more complete technical definition of Water Sensitive Urban Design is included within this document (Section 1.4).



## Executive Summary

The 'Institutionalising Water Sensitive Urban Design in the Greater Adelaide Region' project is an initiative of the South Australian Government, assisted with funding from the Australian Government and support from the Local Government Association (SA).

The purpose of the project is:

- To ensure the philosophy, methodology and techniques of Water Sensitive Urban Design are incorporated into the strategic, urban planning and corporate plans and programs of the State Government and local government;
- To raise awareness and understanding of Water Sensitive Urban Design; and
- To provide training for the development industry, technical design professionals, planners and local government in the application of Water Sensitive Urban Design principles and techniques.

The Greater Adelaide Region covers 18 metropolitan and eight outer metropolitan councils (the Metropolitan Adelaide and Outer Metropolitan Adelaide planning regions). The Region covers the whole of the Adelaide and Mount Lofty Ranges Natural Resources Management (NRM) Board's area of responsibility as well as areas managed by the Northern and Yorke NRM Board and the South Australian Murray Darling Basin NRM Board.

The project responds to and supports:

- South Australia's Strategic Plan;
- The Water Proofing Adelaide Strategy;
- The South Australian Greenhouse Strategy;
- The Planning Strategy;
- The Adelaide Coastal Water Quality Improvement Plan; and
- Related policies, plans and programs.

The process of developing this Framework has occurred in parallel with the development of draft National Guidelines for Evaluating Water Sensitive Urban Development, which are yet to be finalised. To the extent possible, this Framework has been informed by working drafts of those guidelines which are anticipated to be available later in 2008.

## Water Management Challenges

The State Government's population target for South Australia is 2 million persons by 2050, with an interim target of 1.64 million by 2014. More than 80% of this population is expected to live in the Greater Adelaide Region. The Region faces significant challenges with respect to water management and climate change processes; the expected population growth may amplify these challenges.

When catchments become developed, the associated water cycle undergoes a transformation from the natural regime. For Greater Adelaide, if not managed, this transformation may pose a significant risk to the environment and future prosperity as a result of:

- A growing demand for mains water that requires increased abstractions from existing water supply catchments and/or the development of expensive new water supplies;
- Increasing volumes of wastewater and stormwater that require treatment prior to discharge into Gulf St Vincent;
- Increases in the rate and volume of stormwater runoff which can erode waterways and harm ecological habitats;
- Increased mobilisation of pollutants such as nutrients, heavy metals, hydrocarbons, sediment and litter into local waterways, ponds, lakes and the sea;
- A loss of amenity in public places (waterways and lakes can become unattractive and be closed to recreational use due to potential health risks); and
- Increased risk of flooding (changed flow regimes can lead to increased magnitude and frequency of flooding, creating economic losses and social disruption).

## Water Sensitive Urban Design: Enabling Future Growth

Water Sensitive Urban Design (WSUD) is a powerful approach to managing water resources while supporting development. It can enable many of the potential water and land management issues associated with future growth to be addressed in a cost effective manner on an ecologically sustainable basis.

WSUD contributes to reduced mains water use, improved stormwater quality, better managed stormwater quantity and a reduction in wastewater discharge. The implementation of WSUD involves the application of a broad range of principles and measures aimed at:

- Managing the cause of issues at their source wherever practicable;
- Reducing the reliance on imported water for urban water supply systems;
- Optimising the opportunities for the use of stormwater and reuse of wastewater; and
- Reducing the export of stormwater runoff and associated pollutants.



However, to succeed in achieving the above, WSUD relies on the adoption of an integrated water management approach throughout the Greater Adelaide Region.

A unifying Framework can ensure WSUD is systematically integrated within South Australian, local and Australian Government water-related goals and strategies.

## Government Commitment to Water Sensitive Urban Design

This Framework provides a methodology for implementing WSUD in the Greater Adelaide Region and for achieving specific targets. It encourages a consistent approach to design that incorporates WSUD technologies into new and existing developments. The Framework supports the South Australian Government's commitment to incorporating WSUD into its own planning and development processes, as well as requirements placed on private developers, builders, businesses (industrial and commercial) and home owners.

The focus of the Framework is the Greater Adelaide Region; however the general principles contained in this Framework are applicable across South Australia.

The Framework was developed during a time of increasing pressure on the cost of housing and on water supplies and the environment.

It is critical for all participants in the implementation of the Framework to work collaboratively to develop workable approaches which achieve tangible water management outcomes while minimising and/or ideally reducing development costs.

## Features of the WSUD Framework

The WSUD Framework for the Greater Adelaide Region:

- Defines and identifies objectives for WSUD in the context of the Greater Adelaide Region;
- Provides a unifying approach for integrating WSUD within State, local and Australian Government goals and strategies in relation to water management;
- Sets reasonable and achievable development targets for water quality and quantity (with linkages to future Natural Resources Management Board and/or local government water quality and quantity targets);
- Provides an overview of the existing pathway through the development system;
- Recommends and details potential implementation mechanisms for WSUD;
- Clarifies roles and responsibilities; and
- Recommends future training, initiatives and investigations which will encourage the adoption of WSUD in the Greater Adelaide Region.

## Opportunities

The key opportunities for the implementation of WSUD include:

- Establishing WSUD targets for use by local and State Government assessment authorities until such time as targets are refined to suit Natural Resources Management regions, and/or individual catchments and subcatchments;
- Facilitating the adoption of WSUD within local and State Government infrastructure and open space projects through embedding WSUD principles and targets within local and State Government business plans and strategic plans;
- Utilising the planning and development system to encourage WSUD;
- Utilising other statutory approvals processes (to a limited extent) to encourage WSUD; and
- Increasing key stakeholder training and awareness of the need for WSUD.

## Recommendations

There are 22 (unprioritised) recommendations arising from the preparation of this Framework document and from the supporting consultations and investigations. These are:

### Targets

Recommendation 1: Adoption of the WSUD baseline targets.

### Strategic and Business Planning

Recommendation 2: Future reviews and alterations to relevant State Government strategies and plans (e.g. updated Planning Strategy) should have regard to this WSUD Framework to formalise WSUD as a mainstream approach in all urban areas and activities.

Recommendation 3: Local government Strategic Plans and Infrastructure and Asset Management Plans adopt WSUD principles and targets to support the achievement of WSUD objectives.

Recommendation 4: Communicate with State Government agencies to encourage the implementation of WSUD through actions consistent with the State Natural Resources Management Plan, as required under the *Natural Resources Management Act 2004*.

## Stormwater Management Plans

- Recommendation 5:
- (a) Amend the Stormwater Management Planning Guidelines to require relevant catchment-scale targets to be developed during the development of Stormwater Management Plans;
  - (b) Amend the Stormwater Management Planning Guidelines to require Stormwater Management Plans to demonstrate how the actions in the plan contribute to achieving relevant Regional Natural Resources Management Plan targets; and
  - (c) Strengthen the Stormwater Management Planning Guidelines to more specifically require demonstration of integration of Stormwater Management Plan recommendations into day-to-day local government planning activities (policy and assessment).

## Works on Local and State Government Roads

- Recommendation 6: Amend DTEI's *Protecting Waterways Manual* to define water quality targets in accordance with WSUD baseline targets, where appropriate.

## Planning Strategy

- Recommendation 7: Include WSUD baseline targets within the Planning Strategy.

## Development Plan Policy

- Recommendation 8: Finalise the incorporation of WSUD principles within the Better Development Plan (BDP) policy modules.
- Recommendation 9: Undertake a Ministerial Development Plan Amendment (DPA) to assist with the adoption of BDP policy modules throughout the Greater Adelaide Region which incorporate WSUD principles.

## Development Assessment

- Recommendation 10: Undertake further investigations regarding the potential to vary Schedule 5 of the Development Regulations 2008 to outline the type of information pertaining to achieving WSUD objectives that must be included in particular types of development applications.
- Recommendation 11: Initiate the use of checklists which outline the process to consider WSUD principles and which document how targets have been achieved.
- Recommendation 12: Investigate the implications of amending the Housing Code to include relevant WSUD measures.
- Recommendation 13: Investigate the opportunities and costs associated with the establishment of a Water Recovery Fund.

## Communication of WSUD Planning Process

- Recommendation 14: Ensure the information within the Framework and Technical Manual is readily accessible to people who are seeking development approval and who are assessing development.

## Water Affecting Activities (*Natural Resources Management Act 2004*)

- Recommendation 15: Natural Resources Management Boards to liaise with stakeholders to ensure consistency and encourage clarity in relation to permits and approvals for 'water affecting activities' (*Natural Resources Management Act 2004*).

## Licences and other requirements under the *Environment Protection Act 1993*

- Recommendation 16: Investigate the opportunities for amendment of the Environment Protection (Water Quality) Policy 2003 and relevant Codes of Practice to ensure that WSUD objectives and targets are incorporated.

## Approvals for Connection with Public Water Supply and Sewerage Infrastructure

- Recommendation 17: Investigate the potential to apply relevant WSUD principles to any new approval granted in relation to land developments and connection to water supply and sewerage infrastructure owned by SA Water.
- Recommendation 18: WSUD objectives and principles be incorporated into SA Water's Mains Extension Policy, where appropriate.
- Recommendation 19: Review the rating system for connections to the mains supply and sewerage infrastructure to determine if there are opportunities for amendment to assist the future implementation of WSUD principles.

## Approvals Relating to Waste Control Systems

- Recommendation 20: Review the Public and Environmental Health (Waste Control) Regulations 1995 to ensure they support the application of WSUD principles.

## Training and Development

- Recommendation 21: Develop and fund coordinated WSUD education and awareness activities on an annual basis with yearly review to assess effectiveness.

## Action Plan

- Recommendation 22:
- (a) Develop a WSUD Action Plan which outlines how each of the recommendations is going to be achieved within specified timeframes.
  - (b) Monitor and report on the Action Plan's progress in implementing specific recommendations.



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## Glossary

| Term                              | Explanation  |
|-----------------------------------|--|
| Aquifers                          | Underground sediments or fractured rock that hold water and allow water to flow through them. Aquifers include confined, unconfined and artesian types.  |
| Average recurrence interval (ARI) | The average or expected value of the period between exceedances of a given discharge.  |
| Bioretention swale                | A grassed or landscaped swale promoting infiltration into the underlying medium. A perforated pipe collects the infiltrated water and conveys it downstream. Flows are also conveyed along the surface of the swale prior to being infiltrated.  |
| Blackwater                        | Wastewater containing, or likely to be contaminated by, human waste matter (e.g. toilet wastewater or waters contaminated by toilet wastewater).   |
| Brownfield sites                  | Sites where there are opportunities to recycle redundant, surplus and in some cases inappropriately located facilities. Development on sites that have previously been used for urban land uses.   |
| Catchment                         | Area of land that collects rainfall and contributes to surface water (streams, rivers wetlands) or to groundwater.   |
| Class 1 buildings                 | <p>(a) Class 1a – a single dwelling being –</p> <p>(i) a detached house; or</p> <p>(ii) one of a group of two or more attached dwellings, each being a building, separated by a fire-resisting wall, including a row house, terrace house, town house or villa unit; or</p> <p>(b) Class 1b – a boarding house, guest house, hostel or the like –</p> <p>(i) with a total area of all floors not exceeding 300 sqm measured over the enclosing walls of the Class 1b building; and</p> <p>(ii) in which not more than 12 persons would ordinarily be resident.</p> |
| Class 10 buildings                | <p>(a) Class 10a – a non-habitable building being a private garage, carport, shed, or the like; or</p> <p>(b) Class 10b – a structure being a fence, mast, antenna, retaining or free-standing wall, swimming pool or the like.</p>  |
| Commercial                        | Commercial uses can include, but are not limited to, automotive/equipment showrooms, food outlets, restaurants, hotels, garden centres, motels, offices, supermarkets and shops.   |
| Demand management                 | An approach that is used to reduce the consumption of water (also called water conservation).  |

| Term                                 | Explanation   |
|--------------------------------------|---|
| Detention                            | Short term storage of runoff. The objective of a detention facility is to regulate the runoff from a given rainfall event and to control discharge rates to reduce the impact on downstream stormwater systems.   |
| Development                          | As defined by the <i>Development Act 1993</i> .   |
| Ecological footprint                 | Ecological footprinting seeks to determine what total area of land and/or water is required, regardless of where that land and/or water is located, to sustain a given population, organisation or activity. When used as a resource accounting tool, ecological footprinting can indicate when human demand for renewable resources exceeds nature's supply on a local, national or global scale.  |
| Ecologically sustainable development | Comprises the use, conservation, development and enhancement of natural resources in a way, and at a rate, that should enable people and communities to provide for their economic, social and physical well-being while sustaining the potential for natural resources to meet the reasonable foreseeable needs of future generations; safeguarding the life-supporting capacities of natural resources; avoiding, remedying or mitigating any adverse effects of activities on natural resources. |
| Effluent                             | The outflow of water or wastewater from any water processing system or device.  |
| Environmental water requirement      | The water regime needed to sustain the ecological values of aquatic ecosystems, including their processes and biological diversity, at a low level of risk. Basically, this means what these ecosystems (including watercourses, riparian zones, wetlands, floodplains, estuaries, cave aquifer ecosystems) – need.   |
| Eutrophication                       | The ecological changes that result from excess levels of nutrients in waterways and wetlands, often resulting in prolific aquatic plant growth and algal blooms. These conditions can cause a simplification of an ecosystem and a loss of biodiversity.  |
| Evapotranspiration                   | Refers to the total loss of moisture from the soil to the atmosphere through the processes of evaporation and transpiration from growing plants.  |
| Greenfield sites                     | Development on broadacre/broadhectare (usually greater than 4000 square metres) land that has not previously been developed for urban land uses.  |
| Greywater                            | Wastewater from the hand basin, shower, bath, spa bath, washing machine, laundry tub, kitchen sink and dishwasher. Water from the kitchen is generally too high in grease and oil to be reused successfully without significant treatment.  |
| Groundwater                          | Water occurring naturally below ground level or water pumped, diverted or released into a well for storage underground.   |

| Term                           | Explanation  |
|--------------------------------|--|
| ICLEI                          | International association of local governments and national and regional local government organisations that have made a commitment to sustainable development.  |
| Impervious surfaces            | Surfaces that do not allow natural infiltration of rainfall to the underlying soil, thereby increasing the volume and peak flow rate of surface runoff.  |
| Industrial                     | Relating to, derived from, or characteristic of industry. Means premises used for the manufacture, production, processing, altering, cleaning or repair of any article, material or thing whether solid, liquid or gaseous.  |
| Infill development             | Additional development or redevelopment of land within existing urban areas.   |
| Macrophyte zone                | Corresponds to the wet areas of a wetland that are covered with plants such as reeds and rushes. It is sometimes divided into a submerged macrophyte zone where the plants are fully underwater and usually need to stay underwater and an emergent macrophyte zone where plants, while living in the water, extend out above the water surface. Often also called a reed bed. |
| Managed aquifer recharge (MAR) | Managed aquifer recharge is the intentional recharge of water to aquifers for subsequent recovery or environmental benefit.  |
| Nitrogen                       | An important nutrient found in high concentrations in recycled waters, originating from human and domestic wastes. A useful plant nutrient that can also cause off-site problems or eutrophication in lakes, rivers and estuaries. It can also contaminate groundwaters.   |
| Objectives                     | Statements of value that are to be pursued in the long term.   |
| Peak flow                      | The estimated maximum flow at a given location in a catchment, for a selected Average Recurrence Interval.   |
| Phosphorus                     | An important nutrient found in high concentrations in recycled waters, originating principally from detergents but also from other domestic wastes. A useful plant nutrient that can also cause off-site problems of eutrophication in water bodies. It may also be harmful to some native species.  |
| Pervious pavement              | A type of pavement that does not contain fine particles, and which is designed to allow the infiltration of water to an underlying sub-base, thereby producing less runoff than conventional pavements.  |
| Potable water                  | Water suitable on the basis of both health and aesthetic consideration for drinking or culinary purposes (otherwise known as drinking water).  |

| Term            | Explanation   |
|-----------------|---|
| Pre-development | <p>Pre-development refers to the situation where there is no development on the site which is considered to constitute the following scenarios:</p> <ul style="list-style-type: none"> <li>■ If the site is currently developed, then the no development case is where runoff from the site assumes a cleared but grassed state</li> <li>■ If the site is currently vegetated, then the no development case is where runoff from the site assumes the uncleared vegetated state.</li> </ul> |
| Prescription    | Establishes a system for water resource planning and the sustainable allocation and management of water.  |
| Principles      | Rules of conduct that are applied when implementing management actions or making decisions. They provide guidance on how decisions should be made.  |
| Retention       | Permanent storing of runoff indefinitely. Water is stored until it is lost through percolation, taken in by plants, through evaporation or reuse.   |
| Runoff          | Occurs as a result of rainfall and includes roof runoff (i.e. rainwater) and stormwater.  |
| Sediment        | Small-grained material (such as sand, silt and clay) that is carried by water and is deposited on the surface of the land. Sediment is capable of choking and destroying natural aquatic ecosystems.  |
| Stormwater      | Runoff from an area as a result of rainfall which is discharged to drainage infrastructure.   |
| Swale           | Vegetated open channels that capture and treat stormwater runoff by means of filtering and conveyance during regular rainfall events with an average recurrence interval in the range of 3 to 6 months.   |
| Target          | Detailed statements of outcomes against which the success of a plan or strategy can be measured and evaluated. They comprise a quantitative value of some condition or parameter that should be achieved.   |
| Treatment train | A series of treatment measures that collectively address all stormwater pollutants. A treatment train employs a range of processes to achieve pollutant reduction targets.  |
| Wastewater      | Water that has been used for domestic or industrial purposes and is then discharged as waste. The water may be contaminated with solids, chemicals or changes in temperature.   |



## Abbreviations

| Abbreviation | Meaning   |
|--------------|---|
| ARI          | Average recurrence interval   |
| ASR          | Aquifer storage and recovery  |
| BDP          | Planning SA's Better Development Plans project                      |
| DAC          | Development Assessment Commission                                   |
| DEH          | Department for Environment and Heritage                             |
| DPA          | Development Plan Amendment (previously Plan Amendment Report (PAR)) |
| DTEI         | Department for Transport, Energy and Infrastructure                 |
| DWLBC        | Department of Water, Land and Biodiversity Conservation             |
| EDALA        | Electronic land division lodgement                                  |
| EPA          | Environment Protection Authority                                    |
| EPPs         | Environment protection policies                                     |
| ESD          | Ecologically sustainable development                                |
| ICLEI        | See Glossary  |
| MAR          | Managed aquifer recharge  |
| MUSIC        | Model for Urban Stormwater Improvement Conceptualisation            |
| NRM          | Natural Resources Management  |
| PAR          | Plan Amendment Report (now referred to as DPA)                      |
| PIRSA        | Primary Industries and Resources South Australia                    |
| SA Water     | SA Water Corporation  |
| TN           | Total nitrogen  |
| TP           | Total phosphorus  |
| TSS          | Total suspended solids  |
| WSUD         | Water Sensitive Urban Design  |
| WTP          | Water treatment plant   |
| WWTP         | Wastewater treatment plant  |

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### **Consultant Project Management**

The project manager for the consultant team is Dr Kylie Hyde (Australian Water Environments).

### **Client Project Management**

Christine Lloyd (Department of Planning and Local Government).

### **Steering Committee**

A group of local government, industry and agency representatives was formed to provide input and feedback during the preparation of the Framework. This group included representatives from:

- Adelaide and Mt Lofty Ranges Natural Resources Management Board;
- Australian Water Association;
- Department for Transport, Energy and Infrastructure (DTEI);
- Department of Water, Land and Biodiversity Conservation;
- Environment Protection Authority, South Australia;
- Housing Industry Association;
- Local Government Association;
- Department of Planning and Local Government;
- South Australian Murray-Darling Basin Natural Resources Management Board;
- South Australian Water Corporation;
- Stormwater Industry Association; and
- Urban Development Institute of Australia.



### **Technical Subcommittee**

A technical subcommittee, chaired by Dr David Kemp (DTEI), was also formed to review the technical and scientific aspects of the Framework during development. This group included representatives from:

- Adelaide and Mt Lofty Ranges Natural Resources Management Board;
- City of Salisbury;
- Department for Transport, Energy and Infrastructure (DTEI);
- Department of Health;
- Department of Water, Land and Biodiversity Conservation;
- Department of Planning and Local Government; and
- Urban Development Institute of Australia.



# 1 Introduction

## 1.1 Study Area

This document sets out a Framework for the implementation of Water Sensitive Urban Design (WSUD) within the Greater Adelaide Region (see **Figure 1.1**).

The Greater Adelaide Region covers 18 metropolitan and eight outer metropolitan councils (the Metropolitan Adelaide and Outer Metropolitan Adelaide planning regions). The Region covers the whole of the Adelaide and Mount Lofty Ranges Natural Resources Management (NRM) Board's area of responsibility, and parts of the Northern and Yorke NRM Board's and the South Australian Murray Darling Basin NRM Board's areas.

## 1.2 Traditional Approaches

Management of the total water cycle has been predominantly based on large-scale, centralised systems in which different types of water flows (water supply, runoff (including stormwater) and wastewater) are managed separately.

These approaches have been enormously successful in improving the quality of life, particularly through the reliable provision of clean water and reduction in the risk of infectious diseases.

However, the long-term continuation of traditional water management practices is now potentially unsustainable on a variety of social, economic and environmental grounds. This Framework seeks the development and implementation of alternative approaches to water management.

## 1.3 Water Cycle Management

The principles of ecologically sustainable development (ESD) are of considerable relevance to the management of the total water cycle. The total water cycle has an important bearing on the conservation of land and coastal marine resources and biodiversity, and intrinsically affects the quality of life for all urban inhabitants, present and future. A sustainable total water cycle would make a significant contribution to the achievement of ESD.

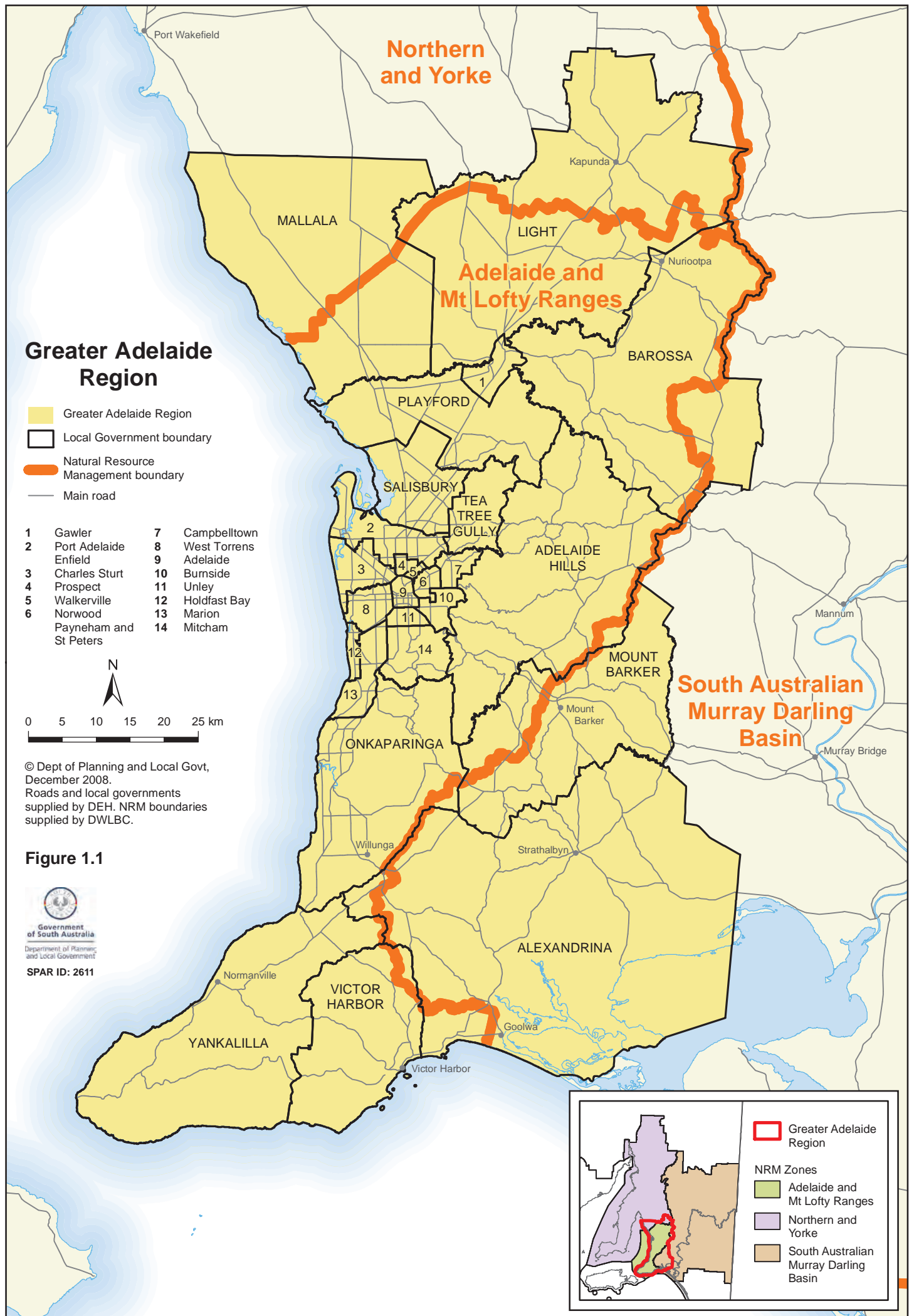
Total water cycle management recognises that water supply, stormwater and wastewater services are interrelated components of catchment systems, and therefore must be dealt with using an holistic water management approach that reflects the principles of ecological sustainability. Water efficiency, reuse and recycling are integral components of total water cycle management and

should be practised when any water is extracted from surface water and groundwater systems.

The broad characteristics that total water cycle management needs to satisfy can be summarised as follows:

- **Consideration of complete cycle** – management should take into account the complete water cycle to include all water flows, such as water supply, runoff, wastewater and groundwater. These flows have quantitative and qualitative impacts on land, water and biodiversity, and the public's aesthetic and recreational enjoyment of waterways.
- **Environmental limits** – demand management processes should be applied to reduce, redirect, avoid or optimise demand for water where unmanaged demand would exceed environmental limits and cause degradation of natural resources.
- **Protection of biological diversity and ecological integrity** – the total water cycle should be managed to protect, maintain and restore aquatic, riparian, estuarine and coastal biodiversity and its supporting ecological processes.
- **Environmental efficiency** – more effective use must be obtained from each unit of water flowing through the urban system by avoidance of use, less wastage in use and distribution, less pollution, more efficient water-using appliances and industrial processes, reuse and recycling of wastewater and use of runoff.
- **Valuation of resources** – to encourage wise use of water, pricing should reflect the full social, environmental and economic costs of use. However, as water is a basic commodity, care must be taken to avoid undue burden on disadvantaged groups.
- **Integration** – the functional demarcations between and within various government agencies responsible for components of the total water cycle need to be integrated through appropriate cooperative and collaborative mechanisms.
- **Community involvement** – community partnerships should be employed to promote widespread community involvement in policy formulation and implementation.

This reflects contemporary desires for more holistic and systems-based approaches to the use and management of land and water resources in urban areas.



## 1.4 What is Water Sensitive Urban Design?

### 1.4.1 Definition

Although there are many variations on the definition of WSUD across Australia, the following definition was considered by key stakeholders to be the most appropriate in the context of the Greater Adelaide Region during the development of the Framework:

“Water Sensitive Urban Design (WSUD) is an approach to urban planning and design that integrates the management of the total water cycle into the urban development process. It includes:

- Integrated management of groundwater, surface runoff (including stormwater), drinking water and wastewater to protect water related environmental, recreational and cultural values;
- Storage, treatment and beneficial use of runoff;
- Treatment and reuse of wastewater;
- Using vegetation for treatment purposes, water efficient landscaping and enhancing biodiversity; and
- Utilising water saving measures within and outside domestic, commercial, industrial and institutional premises to minimise requirements for drinking and non drinking water supplies.”

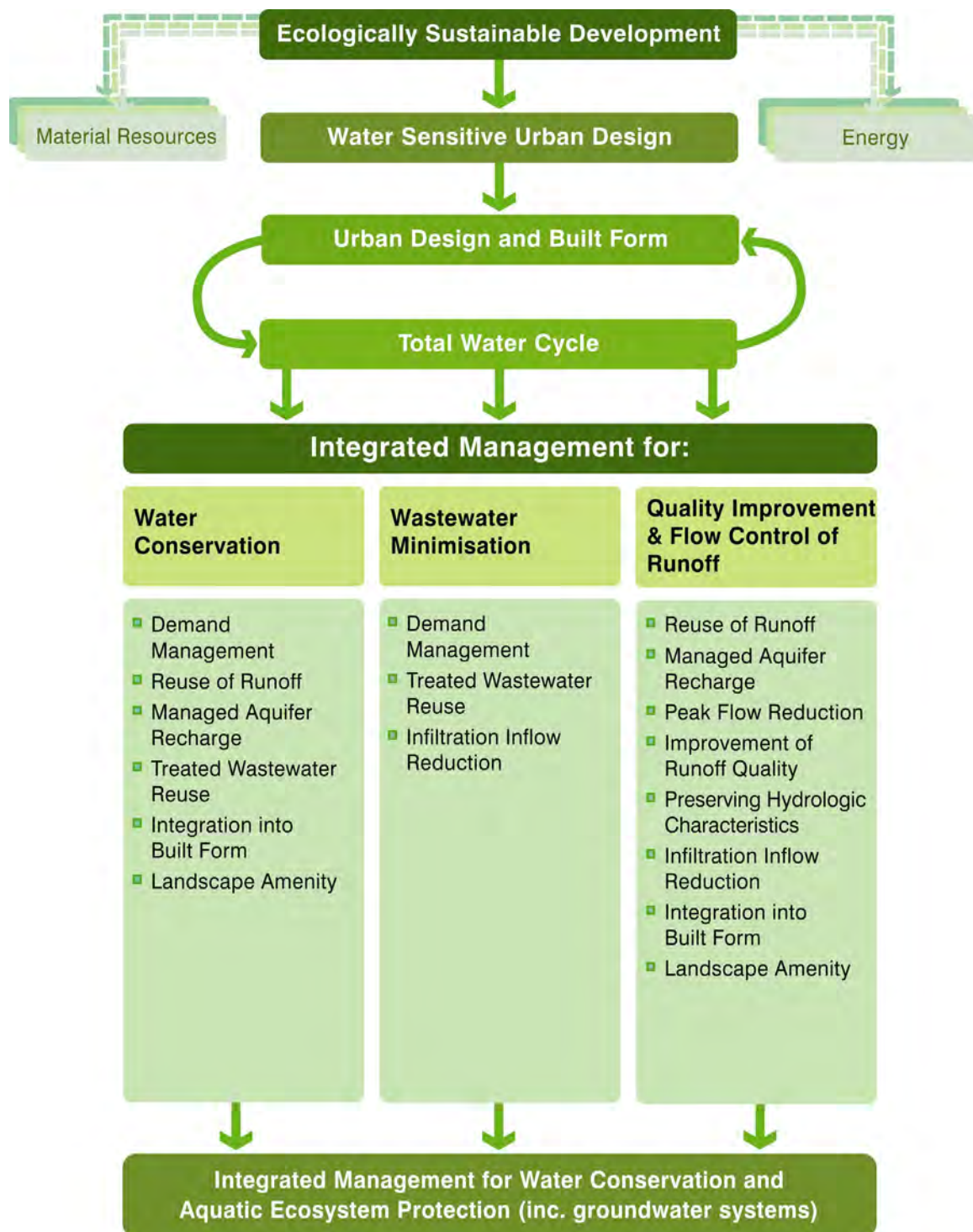
Therefore, WSUD incorporates all water resources, including surface water, groundwater, urban and roof runoff and wastewater.

WSUD is not a solution to all water management issues, but is a critical element in an integrated design and planning solution.

WSUD has multiple environmental benefits including improving the urban landscape, reducing pollutant export, retarding storm flows and reducing consumption requirements.

WSUD, ESD and water cycle management are intrinsically linked as shown in **Figure 1.2**.





**Figure 1.2 Interactions Between Ecologically Sustainable Development, Water Sensitive Urban Design and the Urban Water Cycle**

*Source: Adapted from IE Aust. (2006)*

## 1.4.2 Objectives

The overarching objective (or vision) of WSUD in the Greater Adelaide Region is to stabilise and improve the health of the Greater Adelaide Region's coastal waters, watercourses and groundwater systems while maintaining and enhancing human health and reducing the ecological footprint of the Greater Adelaide Region.

WSUD Frameworks and Guidelines interstate and overseas have wide-ranging and varied objectives which relate to the context in which they were written. A key outcome of consultation undertaken during the development of this Framework was the identification of a number of objectives which were considered to be appropriate for the Greater Adelaide Region.

The key objectives that implementing WSUD seeks to achieve are to:

- Move towards a natural flow regime (for example, lower flows to reduce erosion of creeks and improve/maintain ecological value);
- Manage risk in relation to drought, flood, climate change and public health;
- Protect, enhance, value and conserve water resources;
- Encourage leading practice in the use and management of water resources to increase water efficiency, reduce reliance on imported water and apply at-source reduction of impacts on water quality, flooding, erosion and sedimentation;
- Raise awareness and catalyse change in the design, construction and management of urban development and urban infrastructure; and
- Recognise and foster the significant environmental, social and economic benefits that result from sustainable and efficient use of water resources.

## 1.4.3 Guiding Principles

There are a number of guiding principles that underpin the objectives for water management and the implementation of WSUD in the Greater Adelaide Region. These principles should be addressed when undertaking the planning and implementation of water management.

The guiding principles include:

- Incorporate water resources as early as possible in the land use planning process;
- Address water resource issues and conservation of biodiversity at the catchment and subcatchment level;



- Ensure water management planning is precautionary and recognises inter-generational equity, conservation of biodiversity and ecological integrity;
- Recognise water as a valuable resource and ensure its protection, conservation and reuse;
- Recognise the need for site-specific solutions and implement appropriate non-structural and structural solutions;
- Protect ecological and hydrological integrity;
- Integrate good science and community values in decision making; and
- Ensure equitable cost sharing.

#### 1.4.4 Techniques

WSUD promotes a decentralised approach that is attuned to natural hydrological and ecological processes. It gives greater emphasis to on-site collection, treatment and utilisation of water flows that may be applied in addition to, or in lieu of, conventional measures. WSUD measures can be applied at a broad range of scales, from large public open space areas to individual blocks.

A range of WSUD measures can be implemented depending on the nature of the development and local conditions. Examples include:

- Mains water use reduction:
  - Use of stormwater to replace mains water for irrigation;
  - Water efficient irrigation systems for playing fields and open spaces;
  - Rainwater tanks for garden watering and internal uses, such as toilet flushing and hot water systems;
  - Installation of water efficient fixtures and appliances;
  - Water efficient landscaping;
  - Use of greywater for irrigation and toilet flushing on individual allotments; and
  - Wastewater treatment and reticulation to commercial or industrial users who do not require water of mains water quality.
- Stormwater management:
  - Constructed wetlands and sedimentation basins;
  - Retention or detention basins integrated into public open space;

- Extended detention in major dry basins or in major wetlands, ponds or lakes;
  - Buffer strips, swales or bioretention swales in lieu of piped drainage systems;
  - Downpipes and impervious surfaces not directly connected to the stormwater system (i.e. rainwater tanks), with direct runoff across lawns and gardens (i.e. rain gardens);
  - Minimising impervious areas and enhancing the permeability of remaining pervious areas (e.g. mulching, protection from vehicle compaction, green roofs);
  - Installing on-site detention and retention storage, particularly in multi-dwelling sites (which may be increased in size to allow for water harvesting);
  - Infiltration of runoff to underground aquifers; and
  - Direct connection of downpipes to a separate collection system.
- Wastewater reuse:
- Use of large-scale treated wastewater schemes; and
  - Use of domestic greywater, treated or untreated.

WSUD calls for and requires designers to respond to the constraints and opportunities of each individual site and catchment. Consequently, careful consideration must be given to site characteristics such as soil type, slope, groundwater conditions, rainfall (amount and variability), and the scale and density of development.

The design of WSUD measures continues to evolve. New references and information will become available over time and designers should be encouraged to use new and updated methodologies as they emerge.

Information regarding the selection of technical tools and mechanisms for implementing WSUD is detailed in the WSUD Technical Manual for the Greater Adelaide Region. In addition to the individual chapters on specific aspects of WSUD, an important reference document for stormwater 'source control' philosophy, techniques and design is *WSUD: Basic Procedures for Source Control of Stormwater – A Handbook for Australian Practice* (Allen et al. 2005).

There are already many examples of the successful implementation of WSUD in the Greater Adelaide Region, some of which are illustrated in Figure 1.3.

## 1.5 Scope of This Framework

WSUD should be implemented across the entire range of urban developments in the Greater Adelaide Region, including residential, commercial, institutional, recreational and industrial developments within:

- Greenfields sites (new development);
- Brownfields sites (large scale redevelopment);
- Infill development projects; and
- Established buildings and developments (retrofitting, as opportunities arise).

The adoption of WSUD should also be encouraged in State Government and local government initiatives such as community land redevelopment, the undertaking of institutional and infrastructure projects, and during the development of plans and strategies.

In South Australia, the term 'development' has a statutory meaning under the *Development Act 1993*. This Framework identifies pathways for integrating and/or encouraging WSUD for activities which are defined as development as well as those which are not considered to be development under the *Development Act 1993*.

Examples of  
Water Sensitive  
Urban Design



Gravel Swale,  
Car Park  
Industrial Site,  
Courtesy City  
of Salisbury



Commercial Site Carpark Stormwater Drainage,  
Courtesy City of Salisbury

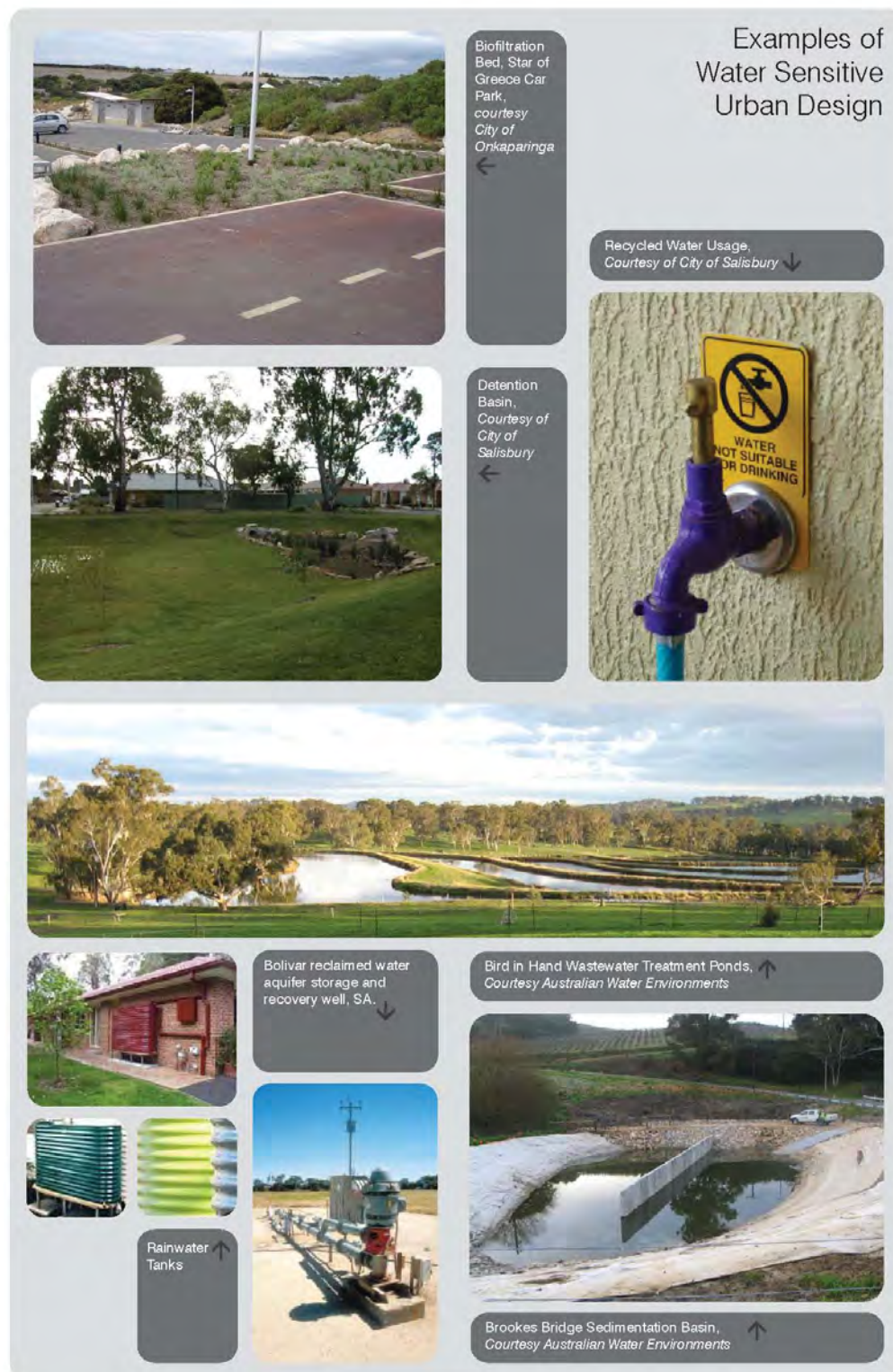


Grange Golf  
Course  
Constructed  
Wetland,  
Courtesy  
Adelaide & Mt  
Lofty Ranges  
NRM Board



Pervious Pavements  
Courtesy University  
of South Australia





**Figure 1.3 Examples of Water Sensitive Urban Design in the Greater Adelaide Region**

Development is defined in the *Development Act 1993* to include:

- A change in the use of land or buildings;
- The creation of new allotments through land division (including Strata and Community Title division);
- Building work (including construction, demolition, alteration and associated excavation/fill);
- Cutting, damaging or felling of significant trees;
- Specific work in relation to State and Local Heritage Places;
- Prescribed mining operations; or
- Other acts or activities in relation to land as declared by the Development Regulations 2008. These include excavation or filling, or constructing a levee or mound in any watercourse zone, flood zone or other area that is subject to inundation.

The components of the definition of development which are most likely to relate to WSUD are those relating to land use change, land division and building work.

Activities which do not constitute development within the meaning of the *Development Act 1993*, but which nonetheless contribute significantly to the form and nature of the Greater Adelaide Region, are also considered within this WSUD Framework. Relevant activities may include State Government and local government infrastructure works, such as road works and drains.

## 1.6 Target Audience

All people who are involved in the development industry and/or the management of water resources in the Greater Adelaide Region are potential users of WSUD, including:

- **Local government and State Government agencies and utilities** – need to develop an understanding of WSUD objectives and targets in order to integrate these into their strategic planning and activities;
- **Land developers** – to achieve WSUD targets, all new development (including, but not limited to, residential, commercial and industrial development) should integrate WSUD approaches, including redevelopment and retrofitting. This Framework sets out the mechanism, while the Technical Manual for the Greater Adelaide Region provides more detailed guidance of how to choose and implement specific WSUD measures. As well as meeting sustainability objectives, the application of WSUD can improve the visual appeal of an area and significantly enhance the value of properties within the development;

- **Professional and technical advisers** – the Framework should provide professional and technical advisers with the necessary understanding of WSUD principles and objectives. More detailed information on how to select WSUD measures to suit individual developments is provided in the supporting Technical Manual for the Greater Adelaide Region.
- **Builders and development owners** – the targets and implementation measures set out in this Framework apply to all new development (including redevelopment). Many of the measures identified can be implemented in and around existing developments.
- **Community** – all members of the community have an interest in supporting the achievement of WSUD objectives.

## 2 Setting the Context

This section provides background information about why water resources are important, how water resources are managed within the Greater Adelaide Region, and what the impacts of development are on water resources.

The legislative framework which currently exists with regards to the water resources of the Greater Adelaide Region is also described.

### 2.1 Water Resources

Water is an environmental resource that we value in all its forms. However, the Greater Adelaide Region faces significant challenges in relation to water supply and management.

#### 2.1.1 Water Supply

The Greater Adelaide Region has a number of sources of water (as illustrated in **Figure 2.1**) including:

- Mt Lofty Ranges Watershed;
- River Murray;
- Groundwater;
- Stormwater; and
- Treated wastewater.

Each of these water sources is discussed below, including the future water source of desalinated seawater.

#### Mt Lofty Ranges Watershed

The Adelaide Hills catchments (termed the Mt Lofty Ranges Watershed) have historically provided, on average, about 60% of metropolitan Adelaide's mains water supplies, but can supply up to 90% in years of abundant rainfall. Water from the Adelaide Hills catchments is also used to support agriculture as well as some industry and residential development through the use of farm dams and from extraction directly from the water courses.

The volume of water which is able to be sourced from the Mt Lofty Ranges Watershed is at risk due to a number of factors including:

- **Farm dam development**
  - Farm dam development has reduced the volume of water flowing into reservoirs which supplies the mains water system;

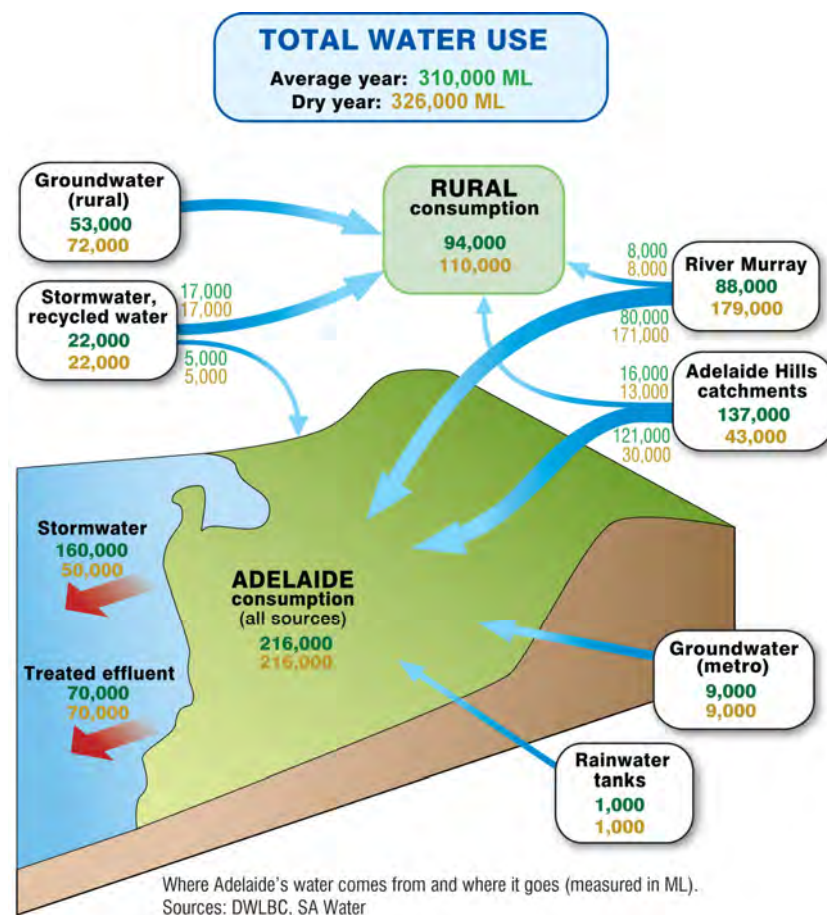


## ■ Climate change

- Climate change predictions anticipate lower average annual rainfall. Reduced seasonal rainfall, particularly during winter and spring, will impact significantly on surface runoff, and result in increased severity and frequency of droughts, further reducing the volume of water captured in the reservoirs;
- Climate change is anticipated to increase the frequency of intense rainfall events which may increase flood risk and pollutant export unless appropriately planned and managed;

## ■ Water quality

- Agricultural, industrial, commercial and domestic activities in the Mt Lofty Ranges Watershed have an adverse impact on the water quality;
- Investigations are currently being undertaken to expand the storage capacity in the Mt Lofty Ranges Watershed and numerous programs are in place to protect the water quality.



**Figure 2.1 Where Adelaide's Water Comes From and Where it Goes**

Source: Water Proofing Adelaide, Government of South Australia (2005)

Note: Treated effluent is the same as treated wastewater

## River Murray

Historically, the River Murray has provided approximately 40% of metropolitan Adelaide's mains water, however in a drought year this can be as high as 90%. The River Murray also supports a large number of country towns, rural communities and regional industries. The River Murray is essential to the social wellbeing and economic prosperity of South Australia.

The volume of water which is able to be sourced from the River Murray is at risk due to a number of factors including:

### ■ Climate change

- Climate change predictions anticipate lower average annual rainfall. Reduced seasonal rainfall, particularly during winter and spring, will impact significantly on surface runoff, and result in increased severity and frequency of droughts, further reducing the volume of water captured in the upstream storages;
- Climate change will cause significant changes in rainfall patterns in the Greater Adelaide Region making the original philosophies of large storages potentially less viable, thus alternative methods that manage water need to be implemented as soon as possible;

### ■ Water allocation

- The amount of water allocated from the River Murray also has an impact on the volume of water available. Allocations currently include irrigation, stock and domestic, and environmental water requirements. There have been numerous occasions where the supply and capacity of the resource has not been able to meet the stated demands. The River Murray Water Allocation Plan is currently under revision;

### ■ Water quality

- River salinity is one of the most important issues relating to water quality of the River Murray. The rise of salinity in the landscape is symptomatic of current land uses that have taken the place of natural systems;
- There are also many pollutants that discharge into the River Murray. Polluted stormwater is discharged from some riverside towns and shacks and houseboats release untreated pollutants. Irrigation drainage water is also often discharged into the River and floodplain;
- Algae occur naturally and usually do not cause any problems. However, toxic algae can be a risk to human health, for both recreational and consumptive water use, and also can kill fish and stock. The major contributors which lead to conditions that are suitable for algal growth in the River Murray are water diversion, low flow rates, and high nutrient levels;

- An emerging water quality issue facing the River Murray is acid sulphate soils. Acid sulphate soils are soils that either contain sulphuric acid, or have the potential to form sulphuric acid when exposed to oxygen in the air. Acid sulphate soils form naturally in both coastal and freshwater environments where there are large amounts of sulphate in the surface or groundwater and large amounts of organic matter, such as decaying vegetation, in waterlogged areas. These waterlogged environments are ideal for the build up of sulphide minerals. Since the completion of the locks, weirs and barrages, sulphide minerals have been collecting in the submerged soils of the Lower Murray region's waterways. When water levels drop and these accumulated sulphide minerals are exposed to air, sulphuric acid is formed;
- If detected and managed appropriately, acid sulphate soils do not pose any major risk. The South Australian Government is closely monitoring the issue of acid sulphate soils along the River Murray and around the Lower Lakes (including possible impacts on water quality) and is developing appropriate management options;
- Measures are in place to manage these threats to the water quality of the River Murray.

## Groundwater

Groundwater resources in the Greater Adelaide Region have been used since before the 1900s and have provided a secure supply for a range of consumptive and environmental uses. It is estimated that groundwater makes up about 20% of the water resource used in and around Adelaide. The primary use of groundwater is for irrigation water supply for high-value horticultural crops in rural parts of the region. Groundwater is also abstracted in the urbanised areas for industrial use and irrigation of parks, golf courses and other green spaces. Groundwater resources also sustain ecosystems by providing baseflow to rivers and streams, water for wetlands and moisture for deep rooted vegetation.

The challenge is to ensure that groundwater extraction does not exceed sustainable limits. Intensive groundwater development for consumptive uses can result in large seasonal drawdowns in groundwater levels. This causes interference between neighbouring wells, an increase in groundwater salinity as surrounding saline water is drawn towards the pumping centres, falling groundwater levels and reduced discharge to streams and wetlands. Groundwater also needs to be protected from potential contaminants.

In recent years there has been increased focus on ensuring groundwater is protected through the prescription and water allocation planning processes.

## Stormwater

Rainfall on urban catchments is collected by a separate network of underground pipes. On average about 160,000 megalitres per year of stormwater (including runoff from the Mt Lofty Ranges), flows through watercourses in the Greater Adelaide Region into Gulf St Vincent. However, actual annual stormwater runoff varies significantly depending on weather patterns. Seasonal and annual variability presents the biggest challenge in maximising the use of stormwater. The availability of space to capture, treat and store large volumes of stormwater, particularly in developed inner-urban areas, is a potentially limiting factor, although innovative approaches may be available to help minimise such limitations and optimise opportunities for stormwater use.

Current stormwater use is estimated to be about 3000 to 5000 megalitres per year. Local government has taken on an increasing role in stormwater reuse projects, often in partnership with or supported by local government, the South Australian Government, Natural Resources Management Boards, the Australian Government and the private sector.

Several additional major stormwater harvesting schemes are under way over the next few years, most notably Water Proofing Northern Adelaide by the project proponents (Cities of Salisbury, Playford and Tea Tree Gully) with support from the Australian and South Australian Governments and the private sector.

### **Recycling and Reuse Schemes - Stormwater**

Urban stormwater reuse schemes, which capture, treat and store stormwater for irrigation and industry use, can be found across Adelaide, for example within the City of Salisbury (Paddocks area), Port Adelaide Enfield Council area (Oakden, Northfield), Playford Council area (Andrews Farm), Scotch College (Mitcham), Brompton, Bowden, St Elizabeth's Church, Warradale, and Morphettville racecourse. Larger, offsite stormwater use is also occurring. For example, the Parafield Partnerships Project, operated by the City of Salisbury and located at the Parafield Airport, captures in excess of one gigalitre of stormwater a year for reuse.

Many of these stormwater reuse schemes store water in aquifers. At Morphettville, the local racecourse stores stormwater in the underlying aquifer and uses it for irrigation.



## Treated Wastewater

About 90,000 megalitres of wastewater is generated in the Greater Adelaide Region each year, of which around 70,000 megalitres is discharged into Gulf St Vincent. Every day more than half the fresh water used in Adelaide homes is returned to sewers from household toilets, showers and washing machines. In addition to this is wastewater from other industrial and commercial sources which is not connected to SA Water's sewerage infrastructure (i.e. trade waste).

The nutrients in recycled water can make it ideal for managed reuse for agricultural and other irrigation purposes. Treated wastewater is currently recycled from wastewater treatment plants (WWTPs) for various purposes, including non-drinking mains water substitution at Mawson Lakes, and horticultural and viticultural uses in the Northern Adelaide Plains and McLaren Vale. In addition, a few smaller developments treat and recycle their wastewater for non-drinking purposes.

Currently almost 20% of Adelaide's wastewater is reused (Department for Transport Energy and Infrastructure SA 2007), primarily for horticultural and viticultural purposes. The amount of reuse varies seasonally and annually due to factors such as climatic variability. Challenges to increased reuse of treated wastewater include the cost for treated wastewater reticulation systems, managing public health and environmental risk, including the long-term impact of salinity on plants and soils, and public perception of treated wastewater use.

### Recycling and Reuse Schemes - Wastewater

The South Australian Government is committing \$30 million to a new pipeline project that will deliver high-quality recycled water to Adelaide's CBD – and substantially reduce harmful nutrients being released into Gulf St Vincent.

As part of the Glenelg to Adelaide Park Lands recycled water project, the Glenelg Wastewater Treatment Plant will be expanded and a 30 kilometre pipeline network laid from the plant, past the Adelaide Airport, into the city centre and North Adelaide.

The pipeline network will deliver recycled water to the Adelaide parklands, potentially enable environmental flows down the River Torrens and make available reused water for 64 commercial development opportunities in the central business district.

The project will result in an increase in the annual reuse of water from the Glenelg WWTP from 8% to 28%.

## Desalination

A 50 gigalitre per annum seawater desalination plant is being planned, with Port Stanvac the preferred site subject to further investigations and environmental assessments, which, along with other measures (including demand management, water recycling, roof runoff and stormwater reuse), will enhance water security in the Greater Adelaide Region water supply.

### 2.1.2 Water Demand

Household water use accounts for approximately 11% of all water use in South Australia under average climatic conditions. The vast majority of household water use is within the Adelaide metropolitan area. Most of Greater Adelaide's water is used by households and agriculture, as is illustrated below.

#### Adelaide Water Use

- Household water use 45%
- Primary production 28%
- Community purposes 17%
- Commercial & industrial 10%

Adelaide water use, all sources  
(approximately 300,000 ML/annum).



#### Household Water Use

- Garden and outdoor 40%
- Bath and shower 20%
- Laundry 16%
- Kitchen 11%
- Toilet 11%
- Other 2%



**Figure 2.2 Adelaide Water Use**

*Source: Water Proofing Adelaide, Government of South Australia (2005)*

Average household consumption is around 234 kilolitres per year. About 40% of this is used on gardens and for other outside uses. Nearly all water used inside the house ends up as wastewater (Department for Transport Energy and Infrastructure SA 2007).

These figures suggest that current drinking water (i.e. mains water) use could be significantly reduced by using non-drinking water for toilet flushing and gardens (up to 45% of total residential water use).

As at 2001-02, Adelaide's demand for mains water could be met from existing resources even though demand had continued to increase due to population growth. However, that level of supply could not continue to be guaranteed in all drought years.

In 2003, permanent water conservation measures were introduced by the South Australian Government as a means to help encourage good water conservation practices. In October 2006, as a consequence of ongoing severe drought in the Murray Darling Basin and reduced rainfall across the Mt Lofty Ranges, the permanent water conservation measures were replaced by the first compulsory water restrictions imposed since the construction of the Mannum to Adelaide pipeline in 1955.

Population growth in the next 20 years will increase demand and may place pressure on particular localities. South Australia's population grew by 0.8% during 2005-06, the highest annual growth rate since the December quarter in 1991. The South Australian Government's population policy aims to reach a population of 2 million by 2050 with a milestone of 1.64 million by 2014. South Australia's population has recently been growing at a rate that, if it continues, may well achieve the 2 million population target before 2050.

### 2.1.3 Impacts of Development

The beaches of the Greater Adelaide Region are an important natural and economic asset for the state of South Australia and are visited by South Australians as well as tourists from interstate and overseas. Gulf St Vincent is a highly productive and biologically diverse ecosystem. The recreational and commercial fishing industries rely heavily on the protection of its water quality as a resource for aquaculture.

Gulf St Vincent receives the Greater Adelaide Region's stormwater and treated wastewater.

Urban development has meant an enlargement of the total surface area impervious to water, leading to increased stormwater discharges into the marine environment. Typically, these untreated stormwater discharges contain nutrients, hydrocarbons, suspended solids and heavy metals, all of which can



be toxic to marine organisms and adversely affect the ecosystems of Gulf St Vincent.

Wastewater treatment plants (WWTP) discharge secondary treated wastewater into Gulf St Vincent. These discharges are high in nutrients and suspended solids and can contain heavy metals such as copper and zinc. Nutrient enrichment, turbidity and erosion are causing seagrass loss at an approximate rate of 100 hectares per year (Environment Protection Authority South Australia 2004).

These historical and current effects have reduced the available habitat, altered water and sand movement, and threatened water quality along the coastline.

The Adelaide Coastal Waters Study (CSIRO 2007) was targeted at developing an understanding of the near-shore coastal environment. The findings of the study indicate that nutrient rich inputs from stormwater, wastewater treatment plants and industrial discharges are the main causes of seagrass loss along the Adelaide coastline. The study made 14 recommendations, the first five of which are focused on the reduction of nutrient rich inputs.

The state and condition of South Australia's natural resources are summarised in **Table 2.1**.

**Table 2.1 A Snapshot - State and Condition of South Australia's Natural Resources**

| Coast and marine  |   |
|---|---|
| Area of seagrass along the Adelaide coastline                         | Decreasing, with 720 hectares lost between 1995 and 2002  |
| Pollutant loads in wastewater discharged into Gulf St Vincent         | Improved. For example, total nitrogen load discharged from the metropolitan wastewater treatment plants to the Gulf is now less than 700 tonnes per annum. In the late 1980s it was more than 2500 tonnes per annum |
| Rivers, streams and wetlands  |   |
| Health of rivers, streams and wetlands                                | Variable but generally in decline due to increasing extraction and drainage for industrial, domestic and agricultural purposes  |
| Water quality   |   |
| Water quality in rivers and streams of the Mt Lofty Ranges            | Moderate to poor; no significant change since 1998  |
| Water quality in rivers and streams of the Adelaide Plains            | To be included when available.  |
| Groundwater quality   | Declining in some regions. The single biggest threat to groundwater quality is salinity   |
| Community   |   |
| Per capita water consumption in the Adelaide metropolitan area        | Reduced from 460 litres per day in 1997-98 to 387 litres per day in 2005-06   |
| The quality of mains water supplied to the Adelaide metropolitan area | Continues to comply with (and sometimes exceed) the national drinking quality guidelines  |
| Reuse of treated wastewater   | Up from 7.6% in 1995 to 20.5% in 2003-04  |

Source: Department of Water Land and Biodiversity Conservation (2006), SA Water (2006)

## 2.2 State Legislation, Strategies and Plans

The objectives and targets contained in various State Government legislation, strategies and plans (see **Figure 2.3**) provide an endorsed foundation for the implementation of WSUD in the Greater Adelaide Region.

Further detail is provided below, and also in **Appendices A** and **B**.

| National Legislation<br>Strategies<br>Policies & Plans   | South Australia's Strategic Plan  |   |   |
|--|---|---|---|
|  | State Legislation   | State Strategies  | Plans, Policies & Codes   |
| <ul style="list-style-type: none"> <li>▪ National Water Quality Management Strategy (1992)</li> <li>▪ National Strategy for Ecologically Sustainable Development (1992)</li> <li>▪ Commonwealth Environment Protection &amp; Biodiversity Conservation Act (1999)</li> </ul> | <ul style="list-style-type: none"> <li>▪ Development Act (1993)</li> <li>▪ Environment Protection Act (1993)</li> <li>▪ Local Government Act (1999)</li> <li>▪ Public &amp; Environment Health Act (1987)</li> <li>▪ Natural Resources Management (2004)</li> <li>▪ Highways Act (1926)</li> <li>▪ River Murray Act (2003)</li> <li>▪ Metropolitan Drainage Act (1935)</li> <li>▪ Sewerage Act (1929)</li> <li>▪ Waterworks Act (1932)</li> <li>▪ Climate Change and Greenhouse Emissions Reduction Act (2007)</li> <li>▪ South Australian Water Corporation Act (1994)</li> <li>▪ Local Government (Stormwater Management) Amendment Act (2007)</li> </ul> | <ul style="list-style-type: none"> <li>▪ Water Proofing Adelaide Strategy (2005 - 2025)</li> <li>▪ Planning Strategy Metropolitan Adelaide</li> <li>▪ Planning Strategy Outer Metropolitan Adelaide</li> <li>▪ Strategic Infrastructure Plan for South Australia 2005/06 - 2014/15</li> <li>▪ Metropolitan Adelaide Industrial Land Strategy</li> <li>▪ State Natural Resources Management Plan</li> <li>▪ Housing Plan for SA</li> <li>▪ Living Coast Strategy</li> <li>▪ Wetlands Strategy for South Australia</li> </ul> | <ul style="list-style-type: none"> <li>▪ Building Code of Australia</li> <li>▪ National Plumbing and Drainage Code</li> <li>▪ Stormwater Management Plans (to be developed)</li> <li>▪ Environment Protection (Water Quality) Policy</li> <li>▪ Code of Practice for Stormwater, Industrial, Retail and Commercial Management (Draft)</li> <li>▪ Urban Stormwater Management Policy 2005</li> <li>▪ Rainwater Tank Policy</li> <li>▪ Code of Practice for Managed Aquifer Recharge</li> <li>▪ Regional Natural Resources Management Plans</li> <li>▪ Development Plans</li> <li>▪ Local Government Strategic Plans</li> <li>▪ Local Government Business Plans</li> <li>▪ Local Government Infrastructure &amp; Asset Management Plans</li> <li>▪ Adelaide Coastal Water Quality Improvement Plan</li> </ul> |

**Figure 2.3 Summary of South Australian Legislation and Strategies Relevant to the Implementation of WSUD in South Australia**

## 2.2.1 Overarching Plan – SA Strategic Plan

South Australia's Strategic Plan sets a pathway to a stronger economy and a more sustainable community.

First released by the State Government in March 2004 (and updated in 2007), the SA Strategic Plan presents ambitious targets to focus government, business and community efforts on six key strategic objectives:

- Growing prosperity;
- Improving wellbeing;
- Attaining sustainability;
- Fostering creativity and innovation;
- Building communities; and
- Expanding opportunity.

The overall goal of the plan is to encourage strong economic growth without compromising the environment or quality of life.

Objective 3 'Attaining Sustainability' establishes a number of targets. The key targets relevant to WSUD in the Greater Adelaide Region are:

- T3.7 – Reduce South Australia's ecological footprint by 30% by 2050;
- T3.9 – South Australia's water resources will be managed within sustainable limits by 2018; and
- T3.10 – Increase environmental flows in the River Murray.

Reducing Adelaide's reliance on the River Murray by promotion and implementation of various alternative water supply, treatment and storage methods would enable greater flows to remain in the River Murray system.

Another target of South Australia's Strategic Plan (T1.22) is to increase South Australia's population to 2 million by 2050. Achieving that while simultaneously achieving the targets above will be assisted by the implementation of WSUD measures.

## 2.2.2 Details of Legislation, Strategies and Plans

Various pieces of State Government legislation and detailed strategies and plans sit beneath the Strategic Plan and assist in meeting its objectives and targets.

They are examined briefly here under the broad headings of:

- Water and natural resources management and associated infrastructure;
- Planning and development system; and



- Climate change.

Legislation, strategies and plans are briefly explained under each heading.

## Water and Natural Resources Management and Associated Infrastructure

### Legislation

Water resources in South Australia are primarily managed under the *Natural Resources Management Act 2004*. Where increased development causes stress on water resources and a higher level of management is warranted, the associated water resources can be prescribed under the *Natural Resources Management Act 2004*. This establishes a water allocation and licensing system to protect the resource from overuse and to ensure water users do not adversely affect each other. It also ensures that the environment is provided with water to sustain ecological values. Where a water resource is prescribed, the *Natural Resources Management Act 2004* requires that the relevant regional Natural Resources Management Board prepares a water allocation plan. This is a statutory instrument to guide the allocation, management and monitoring of prescribed water resources including the transfer of water licences and licensed allocations.

Natural Resources Management Boards develop Water Allocation Plans in consultation with the community. These plans aim to achieve a balance between economic, social and environmental needs and to ensure a more secure allocated supply. Taking of water in these areas, other than for some stock and domestic purposes, requires a licence. The water resources of the Mount Lofty Ranges were prescribed in 2005, providing greater certainty and security of access for regional landholders and the people of Adelaide. The prescription process has been commenced for groundwater in the Central Adelaide Plains.

Licences issued under the *Natural Resources Management Act 2004* specify arrangements under which SA Water can take water for the public water supply.

The State Natural Resources Management Plan is also established under this Act (see section below).

The *River Murray Act 2003* was enacted to ensure that all reasonable and practicable measures are taken to protect, restore and enhance the River Murray, recognising its critical importance to the South Australian community and its unique value from environmental, economic and social perspectives. It has a special focus on ensuring that the use and management of the River Murray sustains the physical, economic and social wellbeing of the people of the state and facilitates its economic development.

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 *Environment Protection Act 1993* protects water quality through the Environment Protection (Water Quality) Policy 2003 and by providing for the licensing of waste discharges that may affect water quality in streams, rivers, coastal waters or groundwater. The legislation also requires that a State of the Environment Report, including information on the state of South Australia's water resources, be produced at least every five years.

The Environment Protection (Water Quality) Policy 2003 and the *River Murray Act 2003* provide an important regulatory framework for consistent water quality management across the state.

The *Waterworks Act 1932* authorises the responsible Minister and the SA Water Corporation to supply water to urban and regional communities and to provide safe drainage of wastewater, rating and pricing arrangements and the construction of necessary works. The *Sewerage Act 1929* empowers SA Water to construct and operate sewerage systems.

The *Metropolitan Drainage Act 1935* provides for flood mitigation works on the River Torrens, Sturt River, and the Brownhill and Keswick Creeks.

The State Government and the LGA entered into an Agreement on Stormwater Management dated March 2006 that provides an improved framework for stormwater management and implementation of priority flood mitigation works based on total catchment planning considerations throughout the State.

The *Local Government (Stormwater Management) Amendment Act 2007*, which came into effect on 1 July 2007, established the Stormwater Management Authority as a body corporate under the *Local Government Act 1999*.

## Strategies / Plans

### **Water Proofing Adelaide Strategy**

A 20-year blueprint for the management, conservation and development of Adelaide's water resources is provided for in Water Proofing Adelaide: A Thirst for Change 2005-2025. It outlines 63 initiatives in key areas of managing existing resources, responsible water use, and additional water supplies and fostering innovation. Consistent with an adaptive management approach it provides for a periodic review with a focus on changes in the environment, technology and knowledge in the intervening period.

The Water Proofing Adelaide strategy sets a number of key targets which include:

- "Work with the other governments of the Murray-Darling Basin to achieve an additional environmental flow in the River Murray of at least

1,500,000 ML per annum by 2018, and to ensure that river salinity levels at Morgan in South Australia do not exceed 800 EC Units for 95% of the time.”

- Reduce annual mains water demand “so that by 2025 consumption will be lower than it would otherwise have been by about 35,000 ML. Households will contribute 30,000 ML towards these savings, commercial and industrial users 2,000 ML, and 3,000 ML will be saved by community purpose users.”
- Protect coastal waters and reduce demand on the mains water system “by increasing the rainwater use, and use of stormwater for non-drinking purposes from an estimated 2,000 ML per annum in 2002 to 20,000 ML per annum by 2025.”

The following Water Proofing Adelaide strategies relate specifically to WSUD:

- Strategy 47 – Water sensitive urban design principles should be incorporated into the Planning Strategy for South Australia and implemented by council development plans and other regulations with the aim of emphasising the integration of water quality, urban amenity and stormwater use with adequate flood mitigation (to be undertaken by Planning SA in partnership with Local Government); and
- Strategies 48 and 56 – Localised reuse of stormwater and/or recycled water, where practical and economic, should be considered in all new land divisions as part of the water sensitive urban development requirements (to be undertaken by Planning SA with DWLBC, NRM Boards, Local Government, DEH and SA Water as partners).“

As well as addressing water needs through infrastructure development, South Australia has implemented initiatives to encourage efficient water use. Permanent water conservation measures to encourage responsible water use have been in place since 2003. Numerous rebates are currently available to encourage households to install water saving devices. Examples of other initiatives include the implementation of water efficiency labelling and standards, education programs and voluntary water audit services.

### **South Australia’s Natural Resources Management Plan**

The State Natural Resources Management Plan, 2006-2011 is established under the *Natural Resources Management Act 2004*. It sets the State Government’s policy direction for an integrated approach to sustainable management of natural resources, including water allocation and management guidelines.

The plan contains South Australia’s resource condition targets which describe the desired condition of natural resources within a desired timeframe. The resource condition targets which the implementation of WSUD can help to achieve include:



- L1 – By 2011, land condition will have improved compared with 2006;
- W1 – By 2011, all ecosystems dependent on prescribed water resources have improved ecological health compared with 2006;
- W2 – By 2020, all aquatic ecosystems have improved ecological health compared with 2006;
- W4 – By 2011, an increase in net water quality compared with 2006;
- B4 – By 2020, a net increase in ecological connectivity across all terrestrial, marine and aquatic ecosystems compared with 2006 values; and
- P1 – By 2011, the capacity of people in the community, institutions and regional organisations to sustainably manage natural resources should be greater than in 2006.

Regional targets, some of which relate to WSUD in the Greater Adelaide Region, are currently being developed as a part of the:

- Development of the Regional Natural Resources Management Plans by the various Natural Resources Management Boards; and
- Development of the Adelaide Coastal Water Quality Improvement Plan.

It is proposed that the regional WSUD related targets (discussed below) be adopted and embraced to assist in achieving relevant state WSUD targets.

### **Regional Natural Resources Management Plans**

Under the *Natural Resources Management Act 2004*, each regional Natural Resources Management (NRM) Board must prepare a regional NRM plan. The plan must be consistent with the State NRM Plan and must include the matters set out in the *Natural Resources Management Act 2004*.

The Greater Adelaide Region includes three NRM regions, covered by the Adelaide and Mt Lofty Ranges NRM Board; the Northern and Yorke NRM Board; and the South Australian Murray-Darling Basin NRM Board. These Boards are currently developing their Regional Natural Resources Management Plans. The Adelaide and Mt Lofty Ranges plan is currently in draft and being consulted on, while the other Board's plans are expected to follow within the next 12 months. The plans will comprise a 10-year strategic plan and a three-year business plan, which will be updated annually to take into account changes, achievements, threats and financial implications.

The Boards are currently establishing targets (at the regional scale) to be included in the regional NRM plans. These targets relate to:

- Stormwater reuse;
- Treated wastewater reuse;
- Flood damage;

- Sustainable development of groundwater resources;
- Estuarine values; and
- Water quality.

The WSUD baseline targets (see **Section 3.1**) (and catchment-scale targets when developed) will help achieve the regional targets set by the NRM Boards.

#### **Adelaide Coastal Water Quality Improvement Plan**

The Adelaide Coastal Water Quality Improvement Plan, being developed by the EPA (due for completion in April 2008), will utilise information from the community to define environmental values and develop associated water quality objectives and river flow objectives. This information should be utilised to define discharge pollutant loads and flow targets.

The WSUD baseline targets (and catchment-scale targets when developed) will help achieve the targets which will be set out by the Adelaide Coastal Water Quality Improvement Plan.

#### **Strategic Infrastructure Plan for South Australia**

In April 2005 the South Australian Government launched the Strategic Infrastructure Plan for South Australia, which marked a major step forward in developing a more coordinated and long-term approach to infrastructure provision.

The plan provides an overarching statewide framework for planning and delivering infrastructure to guide all government and private sector providers. The Strategic Infrastructure Plan emphasises the importance of sustainable approaches to infrastructure provision. The strategic priorities identified in the Strategic Infrastructure Plan for South Australia include:

- Implementation of water education and efficiency programs for users;
- Removal of barriers to water trade; and
- Implementation of the Water Proofing Adelaide strategy.

#### **Sustainable Landscapes Project**

The Sustainable Landscapes Project demonstrates and promotes appropriate park and garden design, plant species selections and sustainable horticultural practices for South Australian environments including effective, efficient and appropriate water use. It is a collaborative partnership between the Land Management Corporation, Innovation and Economic Opportunities Group (through the Mawson Lakes Economic Development Project), Adelaide and Mount Lofty Ranges Natural Resources Management Board, SA Water Corporation and the Botanic Gardens of Adelaide (Department of Environment and Heritage).

## Stormwater

The Stormwater Management Authority was established in July 2007 and is responsible for implementation of the Local Government (Stormwater Management) Agreement between the State Government and local government. The Authority provides funding assistance towards floodplain mapping, preparation of stormwater management plans and priority stormwater infrastructure works.

Stormwater projects must demonstrate a significant flood mitigation component as well as addressing, wherever practicable, value adding opportunities such as stormwater reuse and water quality enhancements to be eligible for funding from the Stormwater Management Fund.

Certain activities – whether development or not – require a licence granted under the *Environment Protection Act 1993*. Licence conditions commonly address stormwater quality and management of pollutants.

The Environment Protection (Water Quality) Policy 2003 contains various provisions about point source pollution and licensed activities. It also specifies a Code of Practice aimed at reducing stormwater pollution through the activities of State, local and Federal Governments. There are Stormwater Pollution Prevention Codes of Practice for:

- Building and construction industry;
- Community; and
- Local, State and Federal Governments.

## Planning and Development System

### Legislation

#### *Development Act 1993*

The *Development Act 1993* provides direction regarding sustainable development and protection of the environment. The objects of the Act appear below (emphasis added):

#### **“3—Objects**

The object of this Act is to provide for proper, orderly and efficient planning and development in the State and, for that purpose –

- (a) to establish objectives and principles of planning and development; and
- (b) to establish a system of strategic planning governing development; and
- (c) to provide for the creation of Development Plans –
  - (i) to enhance the proper conservation, use, development and management of land and buildings; and

- (ii) to **facilitate sustainable development and the protection of the environment**; and
- (iia) to **encourage the management of the natural and constructed environment in an ecologically sustainable manner**; and
- (iii) to advance the social and economic interests and goals of the community; and
- (d) to establish and enforce **cost-effective technical requirements, compatible with the public interest**, to which building development must conform; and
- (e) to provide for appropriate public participation in the planning process and the assessment of development proposals; and
- (ea) to promote or support initiatives to improve housing choice and access to affordable housing within the community; and
- (f) to enhance the amenity of buildings and provide for the safety and health of people who use buildings; and
- (g) to facilitate –
  - (i) the adoption and efficient application of national uniform building standards; and
  - (ii) national uniform accreditation of buildings products, construction methods, building designs, building components and building systems.”

With those objectives in mind, the *Development Act 1993* requires the State Government to publish the Planning Strategy for South Australia and Development Plans.

## Strategies / Plans

### Planning Strategy

The Planning Strategy is a statutory requirement under section 22 of the *Development Act 1993*. It provides direction from the State Government on land use and development issues over the medium term (a period of 10-15 years).

The Planning Strategy may incorporate documents, plans, policy statements, proposals and other material designed to facilitate strategic planning and coordinated action on a statewide, regional or local level.

There are various volumes of the Planning Strategy covering different geographic regions of the state.

The 2006 updates of the Planning Strategy for Metropolitan Adelaide and the Planning Strategy for the Outer Metropolitan Adelaide Region included key policies under the Water Resources sections which are of relevance to WSUD:

- Ensure the most efficient use of water based on the principles of avoidance, reduction, reuse, recycle and appropriate disposal, to reduce Adelaide's dependence on water sourced from the Mount Lofty Ranges catchment and the River Murray;
- Promote WSUD in Development Plans, the Building Code of Australia and development proposals to achieve multiple-catchment water management objectives such as reducing runoff and flooding; protecting waterways and their biotic communities; conserving and harvesting water; and enhancing the amenity of urban environments;
- Integrate the management, protection and use of water resources, into broader land use planning and management;
- Ensure coordination of multi-objective management of stormwater by considering it both as a resource and potential hazard; and
- Increase opportunities for the development of alternative water reuse schemes in appropriate locations.

These policies, whilst providing impetus for policy changes which encourage WSUD, do not provide specific targets for implementation.

### **Development Plans**

The *Development Act 1993* says a Development Plan should be prepared for each part of the state. Each council area in South Australia has a Development Plan and these provide the detailed zones, maps and policies against which development applications are assessed.

The Act says Development Plans should:

"23 (3) ... seek to promote the provisions of the Planning Strategy and may set out or include –

- (a) planning or development objectives or principles relating to –
  - (i) the natural or constructed environment and ecologically sustainable development;
  - (ii) social or socio-economic issues;
  - (iii) urban or regional planning;
  - (iv) the management or conservation of land, buildings, heritage places and heritage areas;



- (v) management, conservation and use of natural and other resources;
- (vi) economic issues;
- (vii) the provision of affordable housing within the community;
- (b) provisions enabling the transfer of development rights between sites;
- (c) material prescribed by the regulations;
- (d) such other material relating to planning or development as may be appropriate."

A Development Plan may describe the characteristics and other aspects of the natural or constructed environment that are desired within the community in order to provide clear direction with respect to development in the relevant area.

Different requirements regarding WSUD appear in current Development Plans; a new, consistent policy module based on leading practice is being developed for insertion into all Development Plans as part of this project.

### **Building Code**

Since 1 July 2006 in South Australia, the building rules have required new dwellings (and some extensions or alterations) to have an additional water supply to supplement the mains water. The additional water supply has to be plumbed to a toilet, to a water heater or to all cold water outlets in the laundry of a new home.

The same rules apply to new extensions or alterations where the area of the extension or alteration is greater than 50 square metres and includes a toilet, water heater or laundry cold water outlet. These provisions are designed to assist in reducing demand on the state's mains water supply.

Installing specially plumbed, minimum-sized rainwater tanks will be by far the most common way of meeting the additional water supply requirement.

Other means of providing the required additional water supply could include developments using a dual reticulated (fixed pipe) water supply system – such as Mawson Lakes – or approved bore water.

If rainwater tanks are to be used to provide the additional water supply, new homes will need to be designed to ensure that rainwater from not less than 50 square metres of the roof is:

- Collected by gutters and downpipes;
- Stored in a rainwater tank; and
- Plumbed to a toilet or a water heater or all laundry cold water outlets.



If the roof catchment area of the building is less than 50 square metres all the water runoff from the roof must be collected, stored and plumbed.

The rainwater tank must have a storage capacity not less than 1 kilolitre (1000 litres). The requirement for a minimum one kilolitre plumbed rainwater tank is additional to any other water storage tank requirements that might be required (e.g. other tanks are required in some areas for bushfire fighting purposes).

Further information is provided at [www.planning.sa.gov.au/go/rainwater-tanks](http://www.planning.sa.gov.au/go/rainwater-tanks)

### **Metropolitan Adelaide Industrial Land Strategy**

A Metropolitan Adelaide Industrial Land Strategy was released by the State Government in May 2007.

The strategy identifies a range of actions to deliver an adequate supply of suitable industrial land in metropolitan Adelaide over the next five to 15 years, including improved monitoring of supply and demand, integration of land use and infrastructure planning, improved use of existing industrial sites and timely development of new sites. The strategy should be implemented in partnership with local government and the private sector.

The development of these industrial sites will be facilitated by master planning and Development Plan Amendments. WSUD should be a key consideration in the preparation of these industrial planning projects.

### **State-Local Government Relations Agreement**

The State Government and local governments in South Australia are committed to maintaining a collaborative and productive working relationship. This commitment was formalised with the signing of the State-Local Government Relations Agreement in March 2004, which provides a framework for focusing joint efforts on agreed priorities.

Key priorities, which are reviewed annually, currently include improving the efficiency and certainty of South Australia's planning and development assessment system, improving stormwater infrastructure and the potential for reuse, providing sustainable wastewater management systems and integrated approaches to natural resource management.

## **Climate Change**

The *Climate Change and Greenhouse Emissions Reduction Act 2007* commits the government to work with business and the community to put in place strategies for early action to reduce greenhouse emissions and adapt to climate change. South Australia should also continue to lead inter-jurisdictional work to develop and implement a Plan of Collaborative Action on Climate Change, as agreed by COAG.

South Australia's Greenhouse Strategy, *Tackling Climate Change*, highlights the vulnerability of water resources. It includes strategies for incorporating climate change into the sustainable management of water resources and explores options for diversifying water supply and more robust management systems to cope with this change. The need to account for climate change impacts is also recognised in natural resources management and water allocation planning.

South Australia's Greenhouse Strategy 2007-2020 defines the aim of WSUD:

"To ensure that development is designed, constructed and maintained to minimise negative effects of urban development on natural hydrological regimes and water quality while minimising water consumption and maximising opportunities for water harvesting and reuse."

The Greenhouse Strategy also states that:

"Energy efficient subdivision layouts and urban form with integrated transport strategies will be complemented by stormwater reuse in water-sensitive urban design and living belts of habitat throughout urban spaces. There is a need to continue to develop best practice while mainstreaming and maximising the use of proven solutions. The Planning Strategy for South Australia is a key policy tool for integrating sustainability with other objectives for urban development."

The Strategy acknowledges that "as well as the direct implications for water supply and rural industries, the prospect of a drier and warmer climate over southern parts of the state increases the need for water sensitive urban design".

Objective 8.2 set by the Strategy is "To incorporate climate change in the sustainable management of water resources and water supply".

### 2.2.3 National Strategies

While not legally binding, national policies and strategies can be instrumental in setting the context for and coordinating Commonwealth and State regulation of the Greater Adelaide Region's waterways and catchments. The national strategies relevant to the implementation of WSUD in the Greater Adelaide Region include the:

- National Water Quality Management Strategy, 1992; and
- National Strategy for Ecologically Sustainable Development, 1992.

## 2.3 Meeting the Challenge

The analysis above reveals that a comprehensive high-order policy and strategic framework is in place to enforce the implementation of WSUD in South Australia. Indeed, many councils have shown considerable initiative and willingness to embrace arrangements that already reflect the principles of WSUD.

In addition, conditions are often placed on development approvals by councils and the Environment Protection Authority (EPA) which relate to WSUD.

However, some gaps exist which, if addressed, could assist in achieving on-the-ground implementation of WSUD and better ensure these concepts are taken up on a more consistent and broader basis in South Australia.

Those gaps are addressed in the following sections of this Framework document, and also with the associated development of the Technical Manual for the Greater Adelaide Region and the inclusion of WSUD related principles in relevant Development Plan (BDP) policy modules.

## 3 Targets for Water Sensitive Urban Design

WSUD can be implemented at a range of scales depending on the size of the development, the nature of the development and the particular characteristics of the catchment in which the development is proposed or currently exists. A decision regarding the type of measures and actions which are most appropriate will depend primarily on local conditions. To ensure an equitable and consistent approach to the implementation of WSUD in the Greater Adelaide Region, baseline targets have been developed which place emphasis on achieving desired outcomes (i.e. performance-based) rather than prescriptive design responses.

This section explains the need for and provides details of the baseline targets for achieving WSUD objectives in the Greater Adelaide Region. The nominated baseline targets are proposed as default values until such a time as catchment-scale targets are developed through mechanisms such as the Stormwater Management Plans and Council Water Management Plans. The catchment-scale and baseline targets are designed to achieve the related, overarching, existing state and regional targets (discussed previously in **Section 2.2**) as illustrated in **Figure 3.1**.

Key mechanisms for ensuring that these targets are met are proposed in **Section 4** of this Framework.

### 3.1 Baseline Targets

Baseline targets are proposed to address the following four aspects:

- Reducing mains water usage;
- Improving quality of runoff;
- Managing the rates of runoff; and
- Managing the volume of runoff.

These are baseline targets to be applied throughout the Greater Adelaide Region where other targets (such as specific catchment-based targets) have not yet been developed. The baseline targets have been developed to provide guidance for the application of WSUD measures to ensure outcomes are obtained that are consistent with the state and regional targets.

It is expected that catchment-scale targets will be developed (which will supersede the baseline targets) where monitoring and modelling data is available (see **Section 3.2**).





Figure 3.1 Strategic Context for the Implementation of WSUD in South Australia

Treated wastewater reuse targets have not been developed at this time. However, a range of Australian water recycling guidelines are available (including for greywater) (see **Appendix E**), and guidance on treated wastewater use is also available from relevant authorities, including the Department of Health.

Ideas for on-site or localised recycling should be discussed with the relevant authorities at an early stage. Water Proofing Adelaide contains a number of strategies concerning water reuse, and the Adelaide and Mount Lofty Ranges NRM Plan also supports reuse (see **Section 2.2**). A large number of South Australian local councils are also undertaking projects to increase the amount of water recycled by their community wastewater management systems, including through the \$90 million Statewide Wastewater Recycling project which is supported by Australian Government funding.

### 3.1.1 Reducing Mains Water Usage

#### Overview

Existing urban water supply systems are approaching their limits and as the population increases we need to make more efficient use of water to support our future growth. New development, redevelopment and alterations to existing buildings can contribute to environmental sustainability by incorporating a variety of water efficiency measures. Reducing consumption also contributes to the reduction/minimisation of wastewater generation (although not necessarily reducing the total contaminant load) and subsequent treated wastewater discharge.

Water demand can be reduced through a number of mechanisms including changing behaviour, restrictions, technology and design.

Permanent water conservation measures for mains water use, involving simple 'common sense' measures for conserving water were introduced in 2003. In some parts of South Australia (including Adelaide) the measures have been temporarily replaced by mains water restrictions due to drought. The permanent water conservation measures apply when water restrictions are not in place. For information about the permanent water conservation measures and mains water restrictions see [www.sawater.com.au](http://www.sawater.com.au).

#### Intent

Better management of water resources will be provided by:

- Increased water use efficiency (such as low water use landscapes and water efficient fixtures and appliances);
- Developing and maximising the resource potential of runoff and treated wastewater to supply a range of water uses usually met by the mains water supply (and sometimes from other sources) (e.g. a 'fit for purpose'



approach where alternative sources of water are used based on their suitability for specific applications);

- Developing the resource potential of runoff and treated wastewater to reduce the cost of drainage, wastewater and potable water infrastructure; and
- Raising community awareness and increasing behaviour change to achieve more efficient water use.

Incidental benefits of some of the above measures include reduced dependence on other sources of water (e.g. from the River Murray and Mount Lofty Ranges), and reduced energy use (and greenhouse gas emissions) associated with fixtures and appliance use, and mains water and sewerage services.

### Application

Targets would apply to all new developments and redevelopments, including:

- Single residential dwellings;
- Residential estates (including on-block measures);
- Multi-unit developments; and
- Commercial, institutional, community service, recreational and industrial developments.

### Performance Targets

The target for reducing mains water use consumption for individual developments is contained in **Table 3.1** (compared with 2003 water usage levels). The Mains Water Use Target is based on current leading practice and research undertaken locally and interstate. This target is intended to contribute substantially towards achieving the goals of the Water Proofing Adelaide Strategy.

**Table 3.1 Mains Water Use Target**

| WSUD Target   | Target |
|---|--------|
| Reduction of mains water use (compared with 2003 <sup>1</sup> ) | 30%    |

Note 1: 2003 is the baseline in the South Australian Strategic Plan for Target 3.9 (South Australian Water Resources are Managed within their Limits). Baseline mains water consumption is the expected average daily mains water consumption that would be generated by the development if no water conservation measures were applied.

## Possible Measures

The target for the reduction of mains water use could be met by a range of WSUD measures, as summarised in **Table 3.2**. The WSUD Technical Manual for the Greater Adelaide Region provide more detailed information regarding how to select and use appropriate WSUD measures and techniques for reducing water usage (in particular **Chapters 4** and **5**). Selection of measures will need to take into account factors such as site conditions, effectiveness, maintenance requirements, greenhouse gas emissions and life cycle costing.



**Figure 3.2 Installation of Rainwater Tanks to Reduce Mains Water Consumption**

**Table 3.2 Possible WSUD Measures for Reducing Water Usage**

| Possible Measures  | Residential Blocks | Multi-unit Residential | Estate Development Works | Commercial, Industrial and Institutional Developments | Capital Works (Roads, Ponds, Earthworks, Public Areas) |
|--|--------------------|------------------------|--------------------------|---|--|
| Water efficient fittings and fixtures  | Yes                | Yes                    | -                        | Yes   | Yes  |
| Water efficient mechanical plant   | Yes                | Yes                    | -                        | Yes   | -  |
| Water efficient landscaping (i.e. rain gardens and green roofs and bioretention systems) | Yes                | Yes                    | Yes                      | Yes   | Yes  |
| Rainwater storage and use  | Yes                | Yes                    | Yes                      | Yes   | -  |
| Use of greywater   | Yes                | Yes                    | -                        | Yes   | -  |
| Use of treated wastewater (if available)   | Yes                | Yes                    | Yes                      | Yes   | -  |

Note: Estate development works apply to residential, commercial and industrial developments and are referring to the works undertaken on the site pre-construction

### 3.1.2 Managing Runoff Quality

#### Overview

Urban runoff has a major (usually extremely detrimental) impact on the water quality of urban waterways and Gulf St Vincent. The design philosophy of immediate collection and piping of runoff to the sea is no longer preferred and runoff should be slowed, treated and utilised with only the residual discharged to the piped system.

The objectives for managing the quality of runoff will be achieved by the combination of works undertaken by local councils, through their capital works programs (with possible support from the Stormwater Management Authority), by various South Australian Government agencies involved in implementing works (e.g. roads and other built infrastructure such as public housing), and by private sector works undertaken in new developments and redevelopments.

The responsibility for meeting targets on development or redevelopment sites lies with the developer or builder (in consultation with the relevant assessing authority), while responsibility for meeting the regional or catchment-based targets lies with the State Government and regional bodies e.g. NRM Boards and regional local government groups.

#### Intent

The intent of setting quality targets for runoff is to provide a water quality management system which ensures the disturbance of waterways is minimised and the discharge of runoff to both surface and underground receiving waters, both during construction and in developed catchments, does not degrade the quality of the receiving waters.

#### Application

Targets would apply to:

- Residential, commercial, institutional, industrial, community service and recreational development; and
- Subdivision that requires the carrying out of road, stormwater or other communal infrastructure works.

#### Performance Targets

The baseline runoff quality targets are shown in **Table 3.3** and they refer to reduction in average annual pollutant export compared to an equivalent urban catchment with no water quality management controls. The removal of the three key urban runoff pollutants of total suspended solids (TSS), total phosphorus (TP) and total nitrogen (TN) are currently regarded as being important to achieving the desired environmental outcomes of the Greater Adelaide Region.

**Table 3.3 Runoff Quality Targets**

| Parameter  | Target <sup>1</sup> |
|--|---------------------|
| Reduction in average annual total suspended solids (TSS) | 80%                 |
| Reduction in average annual total phosphorus (TP)        | 45%                 |
| Reduction in annual average total nitrogen (TN)          | 45%                 |

Note 1: % reduction refers to average annual pollutant load

If the nature and scale of development is such that there is a significant risk of the export of litter, oil and grease then the targets contained in **Table 3.4** will also apply.

**Table 3.4 Gross Pollutant Targets**

| Parameter               | Target  |
|-------------------------|---|
| Litter/gross pollutants | Retention of litter greater than 50 millimetres for flows up to the 3 month ARI peak flow |
| Oil and grease          | No visible oils for flows up to the 3 month ARI peak flow                                 |

The baseline targets have been selected based on consideration of practicality and existing WSUD practice. The baseline targets will make significant improvements to the quality of runoff compared to a 'business as usual' approach although, as previously noted, other possibly higher targets could be considered if warranted by specific catchment-scale targets.

In addition, where a development would entail the discharge of certain pollutants to any water body (including the council stormwater system), the water quality criteria and discharge limits specified in Schedules 2 and 3 respectively of the Environment Protection (Water Quality) Policy 2003 must also be met.

### Possible Measures

The intent may be achieved where:

- The system design minimises the environmental impact of urban runoff on surface-receiving water quality and on other aspects of the natural environment, such as creek configuration and existing vegetation, by employing a variety of techniques that are technically appropriate and effective in reducing runoff and pollution travel in the catchment (e.g. pervious pavements, bioretention systems, swales, constructed wetlands);
- The system design ensures the continuation, in healthy condition, of a wide diversity of environments in the urban landscape (e.g. rain gardens, green roofs, bioretention systems); and

- Point sources of pollution in the catchment are identified and their impact minimised until they can be eliminated (e.g. gross pollutant traps, sedimentation basins).

Adequate provision must also be made during construction to ensure that the landform is stabilised and erosion is controlled (e.g. sedimentation basins, silt fences, hay bales), in order to minimise the risk of pollutants being exported from the site during construction.

A series of treatment measures (e.g. a treatment train) that collectively address stormwater pollutants can be employed to achieve the baseline runoff quality targets.



**Figure 3.3 Constructed Grange Golf Course Wetland for Stormwater Management**

*Source: Courtesy of the Adelaide and Mt Lofty Ranges Natural Resources Management Board*

Measures which will assist in reducing the export of gross pollutants, sediments and nutrients are covered in the WSUD Technical Manual for the Greater Adelaide Region. In brief, they include the use of swales, bioretention systems (trenches, basins, swales), use of buffer strips and better erosion and sediment control on sites. The design of roads, including the medians and verges, in urban areas needs to be sustainable as well as providing the necessary amenity and function.

A summary of possible measures which can assist in meeting the runoff quality targets are summarised contained in **Table 3.5**.



**Table 3.5 Possible Measures to Meet Runoff Quality Management Targets**

| Possible Measures  | Residential Blocks | Multi-unit Residential | Estate Development Works | Commercial, Industrial and Institutional Developments | Capital Works (Roads, Ponds, Earthworks, Public Areas) |
|--|--------------------|------------------------|--------------------------|---|--|
| Gross pollutant traps  | -                  | -                      | Yes                      | Yes   | Yes  |
| Silt fences, hay bales   | Yes                | Yes                    | Yes                      | Yes   | Yes  |
| Sedimentation basins   | -                  | -                      | Yes                      | Yes   | Yes  |
| Constructed wetlands   | -                  | -                      | Yes                      | Yes   | Yes  |
| Buffer strips, pervious pavements, swales and bioretention systems | Yes                | Yes                    | Yes                      | Yes   | Yes  |

Note: Estate development works apply to residential, commercial and industrial developments and are referring to the works undertaken on the site pre-construction

### 3.1.3 Managing Runoff Rates

#### Overview

Urban development generally increases the frequency, volumes and peak flows of runoff, which has a consequential impact on ecosystem health, flooding, public safety and infrastructure requirements. This is due to the introduction of large impervious areas, such as roofs and road surfaces. Existing vegetation and soils are replaced with impervious surfaces connected to gutters, stormwater pipes and concrete channels which also concentrate flows.

The management of runoff rates (and quantity) is therefore necessary to address all scales of flows, from environmental flows, through nuisance (minor) to flood protection (major).

#### Intent

The intent is to provide minor and major drainage systems which:

- Adequately protect people and the natural and built environments at an acceptable level of risk and in a cost-effective manner, in terms of initial cost and maintenance; and
- Contribute positively to environmental enhancement of catchment areas.

## Application

Targets would apply to:

- Residential, commercial, institutional, industry, community service and recreational development; and
- Subdivision that requires the carrying out of road, stormwater or other communal infrastructure works.

## Performance Targets

The baseline targets for managing the rates of runoff from a range of development sites are contained in **Table 3.6**. The performance targets are based on targets adopted locally and interstate and represent an achievable level of managing the rates of runoff.

In addition to the targets below, any development or redevelopment should demonstrate that it will not adversely affect downstream drainage infrastructure.

**Table 3.6 Targets for Rates of Runoff**

| Performance Target                     |   |
|--|---|
| For up to the 5 year ARI               | <p>Pre-development^ peak flows not exceeded.</p> <p>The time to peak matches that of the pre-development case, as far as practical, provided that this does not exacerbate downstream flooding.</p> <p>Runoff is contained within designated flow paths that avoid unplanned nuisance flooding.</p>   |
| For the 5 year, up to the 100 year ARI | <p>Flooding of residential, commercial, institutional, recreational and industrial buildings is avoided.</p> <p>The time to peak matches that of the pre-development case, as far as practical (provided that this does not exacerbate downstream flooding), unless catchment wide benefits can be demonstrated (i.e. for 100 year ARI only).</p> <p>Pre-development peak flows not exceeded.</p> |

Note: ^ Pre-development refers to the situation where there is no development on the site which is considered to constitute the following scenarios:

- If the site is currently developed, then the no development case is where runoff from the site assumes a cleared but grassed state; or
- If the site is currently vegetated, then the no development case is where runoff from the site assumes the uncleared vegetated state.

## Possible Measures

A number of WSUD measures can be utilised in new and existing developments to manage the rates of runoff. These measures can be implemented on individual blocks, within neighbourhoods or regions.

The opportunities for reducing runoff are detailed in the WSUD Technical Manual for the Greater Adelaide Region. A range of possible measures to assist in meeting the runoff targets are summarised in **Table 3.7**.

The measures begin on an individual allotment with simple initiatives to remove direct connections and disperse, infiltrate, store and harvest (i.e. retain) or detain runoff. At neighbourhood or sub-catchment scales, measures to retain or detain runoff can reduce the volume and rate of runoff. A number of these measures can be combined with runoff quality measures.

Opportunities should be sought to utilise surface runoff as a substitution for mains water, particularly for the irrigation of sportsgrounds and public open space.

The intent can be achieved where:

- The stormwater drainage system is designed to have capacity to control flows up to the relevant design flood;
- The capacity of downstream stormwater systems is not exceeded;
- Downstream natural waterways are protected against erosion;
- Design of the stormwater system is undertaken by qualified personnel, using recognised and locally accepted hydrological and hydraulic parameters and design methodology; and
- The design and construction of the stormwater system is in accordance with the requirements of the relevant authorities.

**Table 3.7 Possible Measures to Meet Stormwater Quantity Targets**

| Possible Measures  | Residential Blocks | Multi-unit Residential | Estate Development Works | Commercial, Industrial and Institutional Developments | Capital Works (roads, ponds, earthworks, public areas) |
|--|--------------------|------------------------|--------------------------|---|--|
| Pervious pavements   | Yes                | Yes                    | Yes                      | Yes   | Yes  |
| On-site retention (i.e. rainwater harvesting systems, underground storage tanks) | Yes                | Yes                    | Yes                      | Yes   | Yes  |
| On-site detention  | Yes                | Yes                    | Yes                      | Yes   | -  |
| Retention basins   | -                  | Yes                    | Yes                      | Yes   | Yes  |

Note: Estate development works apply to residential, commercial and industrial developments and are referring to the works undertaken on the site pre-construction

### 3.1.4 Managing Runoff Volumes

#### Overview

Urbanisation alters the total water cycle and the relative balance between runoff, infiltration and evapotranspiration. Increased soil coverage by impervious surfaces generally acts to reduce infiltration and increase the volume of surface water runoff. The reduced recharge to the groundwater system can have an impact on the groundwater levels and subsequently the sustainable extraction of groundwater.

Increasing levels of groundwater extraction have been occurring in the Greater Adelaide Region for irrigation and industrial purposes which has an impact on groundwater levels and groundwater salinity. With the prescription of the Eastern and Western Mount Lofty Ranges and the Central Adelaide Groundwater area, the risk of major groundwater management issues in the Greater Adelaide Region will be significantly reduced.

The management of runoff quantity is therefore necessary to address all scales of flows, from environmental flows, through nuisance (minor) to flood protection (major) and infiltration to the groundwater system (including baseflow).

## Intent

One of the best methods for maintaining the pre-development hydrologic regime is to minimise 'effective imperviousness'. Effective imperviousness is defined as the combined effect of the proportion of constructed impervious surfaces in the catchment, and the 'connectivity' of these impervious surfaces to receiving water bodies. Reducing effective imperviousness is achieved by 'disconnecting' constructed impervious areas from receiving water bodies as well as by reducing the amount of constructed impervious areas.

Therefore, the intent of this baseline target is to minimise the effective area of impervious surfaces used in urban areas and minimise the runoff that they generate into receiving water bodies and stormwater drainage systems.

## Performance Target

Baseline targets for the maximum proportion of the impervious area of a site to be directly connected to the local stormwater drainage infrastructure are contained in **Table 3.8**. These baseline targets have a dual purpose of a reduction in runoff quantity leaving the site (which will address runoff quantity targets) as well as an increase in the amount of water that will infiltrate to the groundwater system.

In addition, groundwater extraction should be managed within sustainable levels as determined by the relevant Natural Resources Management Board and the Department of Water, Land and Biodiversity Conservation.

**Table 3.8 Maximum Proportion of Impervious Area Directly Connected to Drainage Infrastructure**

| Land Use    | Maximum Proportion of Impervious Area Directly Connected to Street Drainage Infrastructure |
|-------------|--|
| Residential | 0.5 (or 50%)   |
| Commercial  | 0.8 (or 80%)   |
| Industrial  | 0.7 (or 70%)   |
| Other       | 0.5 (or 50%)   |

Note: Other refers to (but is not limited to) recreational, social and institutional developments

## Possible Measures

The opportunities for reducing the impervious area of a development which is directly connected to the stormwater drainage infrastructure are discussed in the WSUD Technical Manual for the Greater Adelaide Region. The most efficient scale at which to achieve this target is as near to the source of the runoff as possible. Measures that may be utilised to achieve the proposed



baseline targets include rainwater tanks, rain gardens, pervious pavements, infiltration systems, detention and retention tanks, swales and bioretention systems.



**Figure 3.4 Construction of the Linden Gardens Carpark Using Pervious Pavements**

*Source: Courtesy of City of Burnside*

## 3.2 Catchment Targets

Catchment-scale targets are yet to be developed in most council areas in the Greater Adelaide Region. It is therefore proposed that catchment-scale targets be established by councils in collaboration with the Natural Resources Management Boards and subsequently incorporated within a number of existing mechanisms, such as Stormwater Management Plans and Water Management Plans, where sufficient monitoring and modelling data is available. For example, a number of councils have already set Mains Water Use Reduction Targets for their area and incorporated them in a Water Management Plan (e.g. City of Campbelltown).

These targets will need to be established with regard to targets within approved Regional Natural Resources Management Plans and the Adelaide Coastal Water Quality Improvement Plan. Once catchment-scale targets are developed (and adopted) these will supersede the baseline targets proposed in **Section 3.1**. The relevant plans (i.e. Stormwater Management Plans) will need to be amended to incorporate the catchment-scale targets. Development assessment information and checklists should also be updated to reflect these targets.

For example, developments may be required by councils to:

- Maintain the pre-development hydrologic regime;
- Meet ecological water requirements of the receiving environment (i.e. environmental flows); and
- Meet the water quality objectives as specified in the relevant regional water quality management plan.



**Figure 3.5 Green Roof, Hocking Place, Adelaide**

*Source: Courtesy of Fifth Creek Studio*

### 3.3 Achieving the Targets

The baseline (and catchment) targets are intended to provide certainty to individuals, developers, assessment authorities and others that if the targets are being achieved, then this will contribute substantially to the achievement of the existing state and regional targets.

It is important to recognise that neither the objectives of WSUD (see **Section 1.4**) nor any individual targets stand alone – they all contribute to water resource management objectives. Therefore, targets for water demand, quantity and quality management are not mutually exclusive.

The advantage of performance-based targets is that they allow flexibility in the selection and placement of WSUD measures. This approach more readily encourages integration of WSUD with other measures of project design. A performance-based system also supports the evolution of technologies and an increase in the range of measures commonly available to the development industry. The increased importance of energy and water issues can drive new green industries such as environmentally sustainable building design and technologies, with their own economic benefits, while reducing the ecological footprint (and meeting the targets) of the Greater Adelaide Region.

It is also acknowledged that there are some limitations associated with the adoption of performance-based approaches, as it can become difficult to assess or evaluate at the development assessment stage. Therefore, the Framework suggests that investigation of the provision of 'deem to comply' for site developments, to facilitate complying and/or the straight-forward assessment of new development be undertaken.

It is acknowledged that some WSUD measures require renewal or maintenance in order to stay effective. Mechanisms to encourage adequate maintenance or renewal such as education and training, and/or conditions of approval in some instances may be appropriate.

The linkage between the performance targets and on-ground works to achieve those targets is discussed in the WSUD Technical Manual for the Greater Adelaide Region.

Although it is desirable to strengthen the requirements for achieving WSUD targets in the Greater Adelaide Region (as discussed in more detail in **Section 4**), it is possible to design and implement activities and developments which achieve WSUD targets using the existing regulatory system.

However, what is required is a heightened awareness of the importance of incorporating appropriate WSUD techniques early in the development design process.

Planning to ensure WSUD objectives are met should be part of an urban development from the very beginning. Land use planning techniques and concepts should be applied to development layouts to find all opportunities for the inclusion of WSUD measures.

**Appendix C** provides an outline of the opportunities that are available within the existing design and regulatory processes for incorporating WSUD into proposed developments or activities.

**Section 4** provides recommendations on how the existing processes and systems could be further improved to encourage an accelerated implementation of WSUD in the Greater Adelaide Region.

## 4 Implementation Opportunities

The purpose of this section is to outline the mechanisms through which WSUD can be effectively implemented in the Greater Adelaide Region.

### 4.1 Summary of Key Implementation Opportunities

Various mechanisms which would enhance the implementation of WSUD within the Greater Adelaide Region have been identified through consultation and research. The key opportunities for implementation of WSUD include:

- Establishing WSUD baseline targets for use by council and State Government assessment authorities until such time as targets are refined by way of catchment-scale targets to suit NRM regions, and/or individual catchments and sub-catchments;
- Facilitating the adoption of WSUD within local government and State Government infrastructure and open space projects through embedding WSUD principles and targets within business plans, strategic plans and infrastructure and asset management plans;
- Utilising the planning and development system to encourage WSUD;
- Utilising other statutory approvals processes (wherever practicable) to encourage WSUD;
- Increasing training, awareness and behavioural change of the need for WSUD by key stakeholders;
- The creation of an 'action plan' to provide detailed actions and delegate responsibilities for the implementation of these recommendations; and
- Recognition of the evolving nature of WSUD by ensuring periodic review and update to take account of policy/legislative changes and technology changes.

These opportunities are discussed in the following sections.

Recommendations to achieve each opportunity are also provided. The full list of recommendations is summarised and collated in **Section 6**.

### 4.2 Establishment of WSUD Targets

As discussed in detail in **Section 3**, this Framework has established baseline WSUD targets which can be used by local government and State Government assessment authorities until such time as targets are refined to suit NRM regions, and/or individual catchments and sub-catchments.



These targets will provide landholders, developers, professional advisors and assessment authorities with a realistic and achievable method of designing and assessing proposed developments.

The targets should also provide a useful measure for proposed activities which are not defined as 'development' but which are also trying to achieve WSUD outcomes.

### Recommendation

**Recommendation 1:** Adoption of WSUD baseline targets.

## 4.3 Planning Processes

This section identifies opportunities for implementing WSUD within activities which are not defined as development under the *Development Act 1993* and do not, in general, require any other form of statutory approval.

### 4.3.1 Strategic and Business Planning

Some of the greatest opportunities for promoting sustainable outcomes for the total water cycle occur in the 'plan making' or 'strategic' phases of planning processes. Regional and local strategies are plans that outline a policy approach to planning at the regional or local scale. These documents do not directly 'control' individual development proposals, but rather seek to influence development generally by establishing broad principles, setting targets or creating coordinating mechanisms.

A key mechanism for the implementation of WSUD, in particular for activities not classed as development under the *Development Act 1993* (such as road works), is through local government and State Government strategic and business plans, for example:

- WSUD provides a mechanism for assisting to achieve objectives and targets in State Government documents such as South Australia's Strategic Plan, the Planning Strategy, the Water Proofing Adelaide strategy and the State Natural Resources Management Plan (see **Section 2.2**). Any future reviews and improvements to such plans should have regard to this WSUD Framework to encourage future and further implementation of WSUD;
- Local councils are required under Section 122 of the *Local Government Act 1999* to prepare Strategic Management Plans which, in part, are required to demonstrate the extent to which each council's objectives are related to regional, state and national objectives. There is scope within such plans, therefore, to support the achievement of WSUD objectives at a local scale in order to assist in achieving regional, state and national objectives relating to water management. Recent changes to the *Development Act 1993* have inserted a requirement for councils to produce a Strategic Directions Report (SDR) at least every five years and, in particular, within 12 months



after a significant alteration to the Planning Strategy relevant to their area. Councils are able to integrate this SDR process with the Strategic Management Plan processes which are required under the *Local Government Act* (note: this requirement is pending proclamation). The SDR must address specific issues, including infrastructure planning and integration of transport and land use planning, within the council area. It must also outline a program of Development Plan Amendments (DPAs) to translate those strategic directions into Development Plan content; and

- Councils are also required by the *Local Government Act* to develop and adopt Infrastructure and Asset Management Plans. There is therefore scope to support the achievement of WSUD objectives within these plans.

State agencies and councils are also governed in their activities, to some extent, by the provisions of an applicable regional NRM plan made under the *Natural Resources Management Act 2004*.

All state agencies are required by the *Natural Resources Management Act 2004* to endeavour as far as practicable to act consistently with the State Natural Resources Management Plan and any relevant regional plan<sup>1</sup>. Each council and council subsidiary is required to have regard to any applicable regional Natural Resources Management Plan and, in particular, must give consideration to the question whether it should implement changes to the manner in which, or the means by which, it performs a function or exercises a power or undertakes any other activity that has been identified in the plan as requiring change<sup>2</sup>.

These provisions provide opportunity to apply the targets set out in the regional NRM Plans to the activities of councils and State Government agencies.

Local and State Government infrastructure development should be designed to achieve water management targets which are applicable to the scale and nature of the proposed infrastructure.

Where precinct-scale, catchment-scale and/or regional-scale water-related infrastructure is being proposed, the proponent should liaise closely with other organisations which may have an interest in working collaboratively to achieve WSUD goals. Such organisations may include State Government agencies and authorities, NRM Boards and various local government departments.

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<sup>1</sup> Section 6 of the *Natural Resources Management Act, 2004*

<sup>2</sup> Section 75(9) of the *Natural Resources Management Act, 2004*

### Recommendations:

**Recommendation 2:** Future reviews and alterations to relevant State Government strategies and plans (e.g. updated Planning Strategy) should have regard to this WSUD Framework to formalise WSUD as a mainstream approach in all urban areas and activities.

**Recommendation 3:** Local government Strategic Plans and Infrastructure and Asset Management Plans adopt WSUD principles and targets to support the achievement of WSUD objectives.

**Recommendation 4:** Communicate with State Government agencies to encourage the implementation of WSUD through actions consistent with the State Natural Resources Management Plan, as required under the *Natural Resources Management Act 2004*.

## 4.3.2 Stormwater Management Plans

The *Local Government Act 1999* sets out functions for councils and has recently incorporated a provision to create a special purpose authority, known as the Stormwater Management Authority (SMA), under the Local Government (Stormwater Management) Agreement 2007. The SMA was established on 1 July 2007.

### Stormwater Management Agreement (Schedule 1A)

The objects of the schedule are to ensure that environmental objectives and issues of sustainability are given due consideration in the discharge of local government and State Government responsibilities relating to stormwater management as stated in the agreement.

### Functions of SMA

The SMA's functions include:

- Formulating policies, providing information and facilitating programs by councils promoting the use of stormwater to further environmental objectives and address issues of sustainability including the use of stormwater for human consumption and maintenance of biodiversity; and
- Ensuring that public authorities cooperate in relation to stormwater management planning and construction, and maintenance of works.

The SMA may require a council, or group of councils, to prepare a Stormwater Management Plan. A completed Stormwater Management Plan must be approved by the SMA (once it has received advice from the relevant regional NRM Board on whether the plan contains relevant provisions). The SMA may, by order, require a council to comply with its SMP.

As required under the *Local Government Act 1999*, the SMA issued Stormwater Management Planning Guidelines for Local Governments on 16 August 2007 to guide the development of Stormwater Management Plans. Based on the provisions of the guidelines, Stormwater Management Plans are to include environmental objectives and objectives addressing sustainability issues that are consistent with the *Environment Protection Act 1993* and *Natural Resources Management Act 2004*, and of other relevant legislation aimed at protection or enhancement of the environment, the maintenance of biodiversity and the sustainable management of natural resources.

It is recommended that a requirement for the development of catchment-scale targets when developing Stormwater Management Plans be included in any future revision of the Stormwater Management Planning Guidelines.

The Stormwater Management Planning Guidelines must be approved by the Natural Resource Management Council (which is established under the *Natural Resources Management Act 2004*). An opportunity exists for the guideline document to require consideration of the relevant Regional Natural Resources Management Plan (and in particular the targets) when developing the Stormwater Management Plans. In addition, these guidelines could be strengthened by more specifically requiring the demonstration of integration of the SMP recommendations into day-to-day local government planning activities, including policy and assessment. This would ensure that the Stormwater Management Plans demonstrate how local actions would help achieve the regional targets.

There is therefore significant opportunity to further the implementation of WSUD in conjunction with the Stormwater Management Planning process.

### **Recommendation:**

#### **Recommendation 5:**

- a) Amend the Stormwater Management Planning Guidelines to require relevant catchment-scale targets to be developed during the development of Stormwater Management Plans;
- b) Amend the Stormwater Management Planning Guidelines to require Stormwater Management Plans to demonstrate how the actions in the plan contribute to achieving relevant Regional Natural Resources Management Plan targets; and
- c) Strengthen the Stormwater Management Planning Guidelines to more specifically require demonstration of integration of Stormwater Management Plan recommendations into day-to-day local government planning activities (policy and assessment).

### 4.3.3 Works on Local and State Government Roads

Road runoff and drainage has the potential to impact on aquatic and terrestrial ecosystems through changes to water quality, water quantity and water flow path. Water quality from roads can be directly related to road construction and maintenance activities and vehicle movement and wear. Road construction and maintenance in the Greater Adelaide Region is managed by both councils and State Government and does not require development approval. However, there are a number of opportunities for WSUD objectives, principles and targets to be taken into consideration for road works.

A council is required to have regard to any regional Natural Resources Management Plan that applies within the relevant area and in particular must give consideration to the question of whether it should implement changes to the manner in which it performs a function. This provision in the *Natural Resources Management Act 2004* provides scope for the targets set out in the regional Natural Resources Management Plans to be achieved by local government.

It is recommended that the consideration of WSUD principles in road design and construction be a voluntary commitment by a council and reflected in the council's strategic plan, business plans and technical procedures (see **Recommendation 3**).

In terms of roads managed by the State Government, the Department for Transport, Energy and Infrastructure (DTEI) has in place defined procedures for environmental management. Water quality is managed in accordance with the *Protecting Waterways Manual*, which sets out a risk management approach to water quality. It is recommended that DTEI amend the *Protecting Waterways Manual* to define water quality targets in accordance with the WSUD baseline targets where appropriate.

#### **Recommendation:**

**Recommendation 6:** Amend the DTEI *Protecting Waterways Manual* to define water quality targets in accordance with WSUD baseline targets, where appropriate.

## 4.4 Development System

This section identifies opportunities for implementing WSUD within activities which are defined as development under the *Development Act 1993*.

### 4.4.1 Planning Strategy

Components of the Planning Strategy currently contain provisions which strongly support the implementation of WSUD.

It is recommended that the provisions in the Planning Strategy should be further strengthened in the Planning Strategy Review process, by the inclusion of WSUD baseline targets within the Planning Strategy. This should then have flow-on effects for development policy at the local scale, as Development Plans are required under the *Development Act 1993* to be consistent with the Planning Strategy. Over time therefore the Development Plans should be updated to incorporate revised policies in relation to WSUD where appropriate. This will require consideration of the spatial implications of, and opportunities for, achieving the relevant WSUD targets.

### **Recommendation:**

**Recommendation 7:** Include WSUD baseline targets within the Planning Strategy.

## **4.4.2 Development Plan Policy**

In conjunction with this Framework and associated Technical Manual, Planning SA has developed draft WSUD principles for incorporation within the Better Development Plan (BDP) modules.

The BDP framework proposes a consistent policy regime that can be applied at a variety of scales (e.g. residential, industrial and commercial development). The development of the BDP policy has enabled rigorous consideration of the most effective mechanism for achieving the WSUD targets within the development assessment system.

Each Development Plan should be reviewed and, where necessary, amended to include the WSUD Better Development Plan (BDP) policy modules, once they have been finalised.

Adoption of the BDP policy could be via either voluntary adoption by local government or as a Ministerial Development Plan Amendment (DPA). Councils could be encouraged to include a WSUD DPA as part of their 'Section 30' Development Plan Reviews.

However, such policy amendments will need to respond appropriately to certain circumstances where 'blanket' approaches may not be appropriate, such as small lot size, multi-unit developments, and development within the Mount Lofty Ranges Watershed.

### **Recommendations:**

**Recommendation 8:** Finalise the incorporation of WSUD principles within the Better Development Plan (BDP) policy modules.

**Recommendation 9:** Undertake a Ministerial Development Plan Amendment (DPA) to assist with the adoption of BDP policy modules throughout the Greater Adelaide Region which incorporate WSUD principles.



### 4.4.3 Development Assessment

Recent trends seek to simplify and shorten the development assessment process.

As discussed in **Section 4.1**, while no additional regulatory powers are essential to achieve WSUD in new developments there are some measures that should be considered to support the objective of increasing awareness of WSUD principles as a basic consideration in any development proposal.

Options for utilising the current development assessment process to further encourage the adoption of WSUD include:

- Requiring development applications to include specific information pertaining to WSUD;
- Establishing WSUD assessment checklists;
- Enabling local government to refer certain WSUD development applications to State Government agencies for technical input (advice or direction);
- Encouraging development (as defined by the *Development Act 1993*) in the Greater Adelaide Region to achieve the targets set out in this document; and
- Investigating the establishment of a Water Recovery Fund.

Each of these opportunities is discussed in more detail in the following sub-sections.

#### Require Development Applications to Include Specific Information Pertaining to WSUD

Schedule 5 of the Development Regulations 2008 outlines specific information required to be included in various types of development applications, including land divisions.

The majority of land division applications are now being lodged electronically via the EDALA system. Electronic applications enjoy advantages in the speed and efficiency of lodgement and distribution, and enable the applicant to monitor and assist the progress of applications. However, this can often mean that there is little opportunity for pre-application advice from the planning officers at the relevant council office, which may inhibit the introduction of WSUD measures into land division applications.

Information currently required relating to water management on a proposed development site includes: “arrangements for storage and disposal of waste, stormwater and sewage (if not connected to a sewerage system).”

There is potential to vary Schedule 5 to outline the type of information pertaining to achieving WSUD objectives that must be included in particular types of development applications. For example, Schedule 5 could be amended to state:

“arrangements for water supply and storage and disposal of runoff (including stormwater) and wastewater (if not connected to a sewerage system) including information regarding opportunities for:

- Minimisation of mains water usage;
- Improvement of runoff quality;
- Management of runoff rates and volume quantity (including flood protection and collection and reuse of runoff);
- Management of groundwater levels; and
- Treated wastewater reuse.”

The WSUD Technical Manual for the Greater Adelaide Region provide guidance on the information required and, in particular, an assessment checklist (as discussed below) which would provide assistance to applicants in providing the required information.

It is therefore recommended that further investigations be undertaken regarding the potential to vary Schedule 5 of the Development Regulations 2008.

### WSUD Assessment Checklists

Checklists have been developed within the WSUD Technical Manual for the Greater Adelaide Region which outlines a process to consider WSUD objectives and principles when considering development or redevelopment. The main intention of the checklists is to assist proponents to incorporate WSUD principles into the design of proposals, which can then be verified during the assessment process. The checklists can also assist council officers to identify whether the information provided with a development application is complete prior to assessment. For the majority of developments, this should be a straightforward component of the assessment process. Some developments may be required to provide a report from a qualified person if additional details are required by council's engineers.

It is intended that, because the WSUD targets for residential, commercial, recreational, institutional and industrial development are clearly established in advance, developers will be able to design to meet these targets and the WSUD requirements should not result in increasing the length of time the assessment process takes. It is the intention that WSUD should become standard practice in the Greater Adelaide Region.

It is therefore recommended that the use of these checklists during the development assessment process should be encouraged.

### Referrals to State Government Agencies

Schedule 8 of the Development Regulations 2008 (in accordance with the *Development Act 1993*) outlines certain developments that are required to be referred to the EPA, DWLBC, the relevant NRM Board and other referral bodies. Regulation Clause 29 enables the Development Assessment Commission (DAC) to refer an application for land division to any agency and for the agency to make comment on the application.

A review of the referral process could be undertaken to determine if the current process is adequate to facilitate achieving the objectives of WSUD. Any suggested amendments to the referral process would need to demonstrate a gain in the efficiency of the assessment of development applications. It should be noted that the EPA is currently undertaking a review of developments involving activities of advice or direction.

However, it may be a simple case of providing more clarity to assessment authorities as to what types of applications are relevant to implementing WSUD and when they can or should seek assistance from State Government agencies. Various referrals are currently made to State Government agencies with no statutory standing and are referred to as 'informal referrals'.

The challenge will be to ensure that both the relevant development authority and all referral agencies that have a role in ensuring WSUD is implemented are applying consistent requirements.

Given initiatives to simplify and shorten the development assessment process, increasing awareness and knowledge of WSUD principles provides a significant opportunity to encourage developers to consult with relevant authorities early in the proposal design stage before formal lodgement of a development application.

### Development Encouraged to Achieve the Framework Targets

Development could be encouraged to achieve the targets set out in this Framework by:

- Reference to the NRM Plans;
- Targets being included in the Planning Strategies as guiding policy for Development Plan Amendments (DPAs); and
- Incentives.

Until such time as DPAs are made, which could take a number of years, the baseline targets in this document could be utilised by developers and the development assessment officers as appropriate targets against which to

consider whether or not a development is achieving the appropriate level of water management. This would provide the development industry with an early and clear guide of what will become required practice and provide a background for discussion, learning and innovation within the industry.

The South Australian Housing Code sets out 'deemed-to-satisfy' provisions for the construction of Class 1a and Class 10a buildings (as defined in the Building Code of Australia (BCA) Volume 2) that will meet the requirements of the South Australian *Development Act 1993* and Development Regulations 2008.

The Housing Code is called up in the South Australian Appendix to the BCA as an acceptable construction manual which is deemed to satisfy the performance requirements of the BCA for commonly used materials and methods of construction. Construction in accordance with the Housing Code will satisfy the general requirement for structural adequacy for Class 1a and Class 10a buildings in any part of South Australia allowing for variations in climate and geological or geographic conditions. Building work beyond the scope of the Housing Code must comply with the BCA.

The South Australian Housing Code could therefore be amended to include WSUD measures. For example, the supplementary water supply (rainwater tank) policy was implemented through a state amendment of the BCA and the South Australian Housing Code.

It is therefore recommended that the implications of amending the South Australian Housing Code to include relevant WSUD measures be investigated.

### Investigate the Establishment of a Water Recovery Fund

It is recognised that in some instances it may not be possible to use WSUD approaches to achieve the baseline targets. It is therefore recommended that the establishment of a Water Recovery Fund be investigated, similar to the Open Space Contribution Scheme, where developers would contribute towards a catchment-based water management scheme. These funds could then be used by a combination of local government, NRM Boards and State Government to assist with the implementation of off-site catchment or regional works to achieve relevant WSUD targets.

It is therefore recommended that the establishment of a water recovery fund be investigated.

### Recommendations:

**Recommendation 10:** Undertake further investigations regarding the potential to vary Schedule 5 of the Development Regulations 2008 to outline the type of information pertaining to achieving WSUD objectives that must be included in particular types of development applications.

**Recommendation 11:** Initiate the use of checklists which outline the process to consider WSUD principles and which document how targets have been achieved.

**Recommendation 12:** Investigate the implications of amending the Housing Code to include relevant WSUD measures.

**Recommendation 13:** Investigate the opportunities and costs associated with the establishment of a Water Recovery Fund.

#### 4.4.4 Communication of WSUD Planning Process

To achieve the optimal outcome in the application of WSUD principles and measures within a development, integration of detailed planning, engineering, landscaping and ecology is an absolute necessity. For this to occur, a process which addresses the relevant tasks in a logical manner is required.

Information about WSUD requirements, as well as checklists and/or other relevant planning assistance tools, should be provided to potential applicants by the relevant authority. This will encourage the consideration of WSUD measures at the earliest possible stage of development planning and design.

Multi-lot developments and subdivisions will benefit from early consideration of WSUD targets in the planning and design process to maximise opportunities for cost savings and efficiencies in construction.

When communicating the Framework and Technical Manual to users, the documents need to be brief, free of jargon and provide practical photographic examples.

##### **Recommendation:**

**Recommendation 14:** Ensure the information within the Framework and Technical Manual is readily accessible to people who are seeking development approval and who are assessing development.

### 4.5 Other Statutory Approvals Processes

#### 4.5.1 Water Affecting Activities (*Natural Resources Management Act 2004*)

Any bore drilling and aquifer storage presently requires a permit under the *Natural Resources Management Act 2004* as 'water affecting activities'. For prescribed water resources, the subsequent extraction of stored water also requires a water licence.

It should be noted that the grant of development authorisation in respect of an activity removes the need to obtain a permit under the *Natural Resources*



*Management Act 2004* (except in the case of bore works). It is therefore important for councils and NRM Boards to work together where an activity is development, to ensure consistency in application of WSUD.

If required, additional activities which have an impact on WSUD as 'water affecting activities' could be prescribed under the Natural Resources Regulations, thus triggering the requirement for a permit for the activity to be obtained under the *Natural Resources Management Act 2004*.

**Recommendation:**

**Recommendation 15:** Natural Resources Management Boards to liaise with stakeholders to ensure consistency and encourage clarity in relation to permits and approvals for 'water affecting activities' (*Natural Resources Management Act 2004*).

#### 4.5.2 Licences and Other Requirements under the *Environment Protection Act 1993*

Certain activities – whether development or not – require a licence granted under the *Environment Protection Act 1993*. Licence conditions commonly address stormwater quality and management of pollutants. The discharge of stormwater from stormwater infrastructure to underground aquifers in the metropolitan Adelaide region is presently an activity specifically requiring a licence. In determining a licence application, the EPA must have regard to specified matters, including the provisions of an applicable Environment Protection Policy (EPP).

The Environment Protection (Water Quality) Policy 2003 contains various provisions about point source pollution and licensed activities. It also specifies Codes of Practice aimed at reducing stormwater pollution through the activities of State, local and Federal Governments.

An opportunity exists to seek amendment of the EPP and relevant Codes of Practice to ensure that WSUD objectives and targets are incorporated.

**Recommendation:**

**Recommendation 16:** Investigate the opportunities for amendment of the Environment Protection (Water Quality) Policy 2003 and relevant Codes of Practice to ensure that WSUD objectives and targets are incorporated.

### 4.5.3 Approvals to Connect to Water Supply and Sewerage Infrastructure

Approval from SA Water is required to connect to water supply and sewerage infrastructure owned by SA Water. The approval may include conditions on the use of the connection.

SA Water could apply relevant WSUD principles to new approvals provided this is consistent with SA Water's statutory functions under the *South Australian Water Corporation Act 1994*, and with SA Water's charter (prepared under the *Public Corporations Act*).

SA Water's Mains Extension Policy covers all of SA Water's requirements for land developments, mains extensions and connections and is the ideal corporate vehicle to foster facilitate or enforce WSUD requirements for 'connections/developments'. This policy is currently being rewritten as a series of about 10 policy documents and the timing and intent is right to include reference to WSUD principles and objectives.

The current SA Water rating systems (under the *Waterworks and Sewerage Acts*) charges property owners on the basis of their abutment to gazetted mains. They allow no account to be taken of the extent of full or partial self-sufficiency that a property may have established in terms of water or wastewater. Hence the rating system (which is different to the pricing system) offers no encouragement for WSUD. However, other factors also need to be considered. SA Water mains water supply becomes the supply of last resort when independent systems fail and so is required to be maintained whether it is being used or not. For instance this supply is needed for fire fighting purposes and there are risk and insurance issues where it is absent. Land values are also higher where serviced by mains systems.

It is therefore recommended that a review of the rating system for connections to the mains supply and sewerage infrastructure be undertaken to determine if there are opportunities for amendment to assist the future implementation of WSUD.

#### Recommendations:

**Recommendation 17:** Investigate the potential to apply relevant WSUD principles to any new approval granted in relation to land developments and connection to water supply and sewerage infrastructure owned by SA Water.

**Recommendation 18:** WSUD objectives and principles be incorporated into SA Water's Mains Extension Policy, where appropriate.

**Recommendation 19:** Review the rating system for connections to the mains supply and sewerage infrastructure to determine if there are opportunities for amendment to assist the future implementation of WSUD principles.

#### 4.5.4 Approvals Relating to Waste Control Systems

The Public and Environmental Health (Waste Control) Regulations 1995 apply to the installation, alteration and maintenance of waste control systems (e.g. septic tanks). The regulations prescribe the type of waste control systems that can be installed, and may therefore limit the use of black and greywater, or dictate the treatment and disposal processes. The regulations also prescribe the minimum size allotments where on-site disposal systems are permitted.

A review should be undertaken to ensure that the Public and Environmental Health (Waste Control) Regulations 1995 support the application of WSUD principles.

**Recommendation:**

**Recommendation 20:** Review the Public and Environmental Health (Waste Control) Regulations 1995 to ensure they support the application of WSUD principles.

## 4.6 Training and Development

### 4.6.1 Overview

People are often unaware that their activities can impact on water resources and result in environmental degradation. Once aware and informed of simple solutions that reduce or avoid causing stormwater pollution or excessive water usage, a change in people's behaviour is more likely. However, it is recognised that education and awareness is only one of the approaches to ensure consistent and effective implementation of WSUD.

In order to support both the development industry and the assessment authorities in the introduction and ongoing management of new requirements in relation to WSUD, it is proposed to develop and provide ongoing information and training support.

In addition to the existing range of capacity building initiatives and resources, such as Water Care, SA Water and ICLEI, specific education and awareness of WSUD within various groups should be undertaken in a coordinated manner each year to ensure that the objectives and processes for implementing WSUD are understood. This should increase individuals' commitment to achieving WSUD targets as well as helping to maintain staff and expertise.

Various WSUD training and development modules have been developed. The purpose of these training modules is to ensure that key stakeholders and/or WSUD practitioners are aware of and understand this Framework and the supporting Technical Manual and the associated principles in BDP modules.

Education will be critical to the successful implementation of WSUD policies in any municipality. Such education must work at a number of levels, including:

- The broad community;
- The developer community;
- The design community; and
- Council officers.

#### **4.6.2 The Broad Community**

The community is generally supportive of the drive for water sustainability. However, a targeted media campaign including demonstrations of how WSUD can be incorporated without detriment to a home or development would be useful in addressing concerns with potential retrofitters or new home-owners.

#### **4.6.3 The Developer Community**

The developer community, like the broader community, is not an homogeneous group. Some development groups are already showing a growing interest in WSUD, whether spurred on by environmental concern or by the opportunity to gain a 'marketing edge'. This level of interest is most likely to be seen at the large end of the industry.

For smaller building and/or development organisations, clear council requirements in relation to WSUD incorporation into all developments should be provided and communicated. Incentives may be appropriate together with:

- Easy to use guidelines for the incorporation of WSUD (as this project aims to provide);
- Demonstration projects that allay fears about how difficult it is, how it might look and other concerns of small and medium sized developers/builders; and
- Incentives.

#### **4.6.4 The Design Community**

As the design community is the one that has to 'deliver' on the requirements, education is critical. Awareness raising of sustainability issues, and WSUD in particular, could be run in parallel, but more directly targeted, with the broader community awareness raising.

More detailed design education can be achieved through professional journals and publications. At a higher level, training through universities and TAFEs should be encouraged to ensure that future generations of designers have a fundamental understanding of the issues.

#### 4.6.5 Council Officers

This group is responsible for the review and approval of most development that could incorporate WSUD measures. Their understanding of the principles and practices is critical to achieving successful developments on the ground. Specific officers may need to attend the training of the design professions in order to have sufficient understanding to critically assess development proposals. Council officers should also be provided with opportunities to have input into the periodic review of the WSUD Framework and Technical Manual.

##### **Recommendation:**

**Recommendation 21:** Develop and fund coordinated WSUD education and awareness activities on an annual basis with yearly review to assess effectiveness.

### 4.7 Development of an Action Plan

An agreed program of joint implementation and investment must follow and accompany this Framework, to ensure its critical benefits are realised.

It is therefore recommended that an action plan be developed which outlines how each of the recommendations are going to be achieved and within what timeframes.

The action plan should also ensure and allow the clear delineation of agreed 'roles, responsibilities, and resources' – both between State Government agencies and between the three tiers of government, including local government, for the continued championing of WSUD in the Greater Adelaide Region.

##### **Recommendation:**

##### **Recommendation 22:**

- (a) Develop a WSUD Action Plan which outlines how each of the recommendations is going to be achieved within specified timeframes; and
- (b) Monitor and report on the Action Plan's progress in implementing specific recommendations.



## 4.8 Summary

A summary of the above recommendations for improving and encouraging the implementation of Water Sensitive Urban Design is provided in **Section 6**.

## 5 Roles and Responsibilities

All key stakeholders have a role in the implementation of WSUD in the Greater Adelaide Region. The key stakeholders include:

- State Government agencies and utilities;
- Local government;
- Land developers;
- Professional and technical advisers;
- Builders and development owners; and
- Community.

The roles and responsibilities of each of these key stakeholder groups is discussed in the sections below and refers to the relevant legislation, policies and strategies discussed in **Section 2.2**.

### 5.1 State Government Agencies and Utilities

#### 5.1.1 Department of Planning and Local Government

The Department of Planning and Local Government (DPLG, formerly Planning SA) is the State Government's advisory agency on land use planning, development policy and strategy, the building code, and urban design and open space policy.

DPLG provides advice to the Minister for Urban Development and Planning, works closely with other State Government agencies and local government, and liaises with key stakeholder groups. DPLG also assists the Minister for Urban Development and Planning in the administration of the *Development Act 1993* and related legislation, including in the assessment of major development proposals.

Suggested key roles for DPLG with regards to WSUD include:

- Ensuring that WSUD objectives, principles and targets are incorporated in the Planning Strategy;
- Ensuring that development control policies in Development Plans meet WSUD principles and objectives;
- Developing awareness of water management requirements and responsibilities among employees and stakeholders; and
- Ensuring that all development proposals and applications assessed (including major projects) meet WSUD objectives and principles.

## 5.1.2 Environment Protection Authority

The Environment Protection Authority (EPA) is responsible for the protection of South Australia's environment by application of statutory powers described in the *Environment Protection Act 1993*.

A major role of the EPA is to ensure that the environment is protected when development decisions are made. It does this by providing advice to Planning SA and local government.

Another key instrument used by the EPA is the development of Environment Protection Policies (EPPs).

Key roles and suggested roles for the EPA with regards to WSUD include:

- Providing advice on development proposals as required and ensuring that WSUD measures relating to water quality are incorporated in the proposals. The EPA is a referral body for certain forms of development, pursuant to Schedule 8 of the Development Regulations 2008;
- Establishing and reviewing Environment Protection Policies (EPPs) to ensure they support the WSUD objectives and targets;
- Setting conditions and providing advice on environmental management (with regards to quality) of stormwater, wastewater and groundwater;
- Assessing the environmental performance of stormwater and wastewater management; and
- Developing awareness of water management requirements and responsibilities among their employees and stakeholders.

## 5.1.3 Department of Water, Land and Biodiversity Conservation

The Department of Water, Land and Biodiversity Conservation's (DWLBC) key objective is to improve sustainability through the integration and management of all of the State's natural resources and to improve health and productivity of South Australia's biodiversity, water, land and marine resources. The statutory powers of DWLBC are described in the *Natural Resources Management Act 2004*.

Key roles and suggested roles for DWLBC with regards to WSUD include:

- Providing advice on development proposals. The DWLBC is a referral body for certain forms of development, pursuant to Schedule 8 of the Development Regulations 2008;
- Issuing of water licences and permits and managing the allocation of the State's water resources;
- Providing natural resources management policy advice to Government; and

- Developing awareness of WSUD water management requirements and responsibilities among their employees and stakeholders.

#### 5.1.4 Natural Resources Management Boards

Natural Resources Management (NRM) Boards in South Australia have an active role with respect to the management of natural resources and are vested with the responsibility of preparing, implementing and reviewing a regional NRM Plan in accordance with the *Natural Resources Management Act 2004*.

Key roles and suggested roles for NRM Boards with regards to WSUD include:

- Developing Natural Resource Management Plans;
- Promoting public awareness and understanding of the importance of implementing WSUD to contribute to integrated and sustainable natural resources management;
- Working with other government agencies to provide mechanisms to increase the capacity of people in the region to implement WSUD; and
- Developing awareness of water management requirements and responsibilities among their employees, stakeholders and contract partners.

#### 5.1.5 Department for Environment and Heritage

The Department for Environment and Heritage (DEH) is responsible for nature conservation, heritage conservation and animal welfare. It collects and provides information about the State's environment, manages public land and advises on environmental policy.

In addition, the Coast Protection Board manages coast protection issues and provides advice on coastal development.

Key roles and suggested roles for DEH with regards to WSUD include:

- Encouraging the adoption of WSUD objectives, principles and targets within DEH projects and activities; and
- Developing awareness of water management requirements and responsibilities among their employees, stakeholders and contract partners.

#### 5.1.6 Department for Transport, Energy and Infrastructure

The Department for Transport, Energy and Infrastructure (DTEI) is a major infrastructure provider and needs to take into account water management when delivering and managing infrastructure and services to the community.

DTEI currently has in place defined procedures for environmental management. Water quality is managed in accordance with the *Protecting Waterways Manual*, which sets out a risk management approach.

Key roles and suggested roles for DTEI with regards to WSUD include:

- Ensuring inclusion of WSUD principles and objectives when designing and implementing infrastructure;
- Providing advice on development proposals as required and ensuring WSUD measures are incorporated in the proposal. DTEI is a referral body for certain forms of development, pursuant to Schedule 8 of the Development Regulations 2008;
- Ensuring that major departmental projects include and implement management plans that address water management issues; and
- Developing awareness of water management requirements and responsibilities among their employees, stakeholders and contract partners.

### 5.1.7 South Australian Water Corporation

The South Australian Water Corporation (SA Water) provides water supply and wastewater services to the metropolitan area, regional centres and communities. One of the key roles of SA Water is to work with other State Government agencies to ensure that current water supply sources are sustainable.

Key roles and suggested roles for SA Water with regards to WSUD include:

- Developing and implementing a pricing structure that fosters WSUD;
- Working with other government agencies to encourage the implementation of WSUD to help ensure that current water supply sources are sustainable;
- Developing awareness of WSUD related water management requirements and responsibilities among their employees, stakeholders and contract partners; and
- Ensuring that fire protection requirements are adequately considered within WSUD design.

### 5.1.8 Department of Health

The Department of Health (DoH) provides health services to the metropolitan area, regional centres and communities. One of the key roles of DoH is to work with other State Government agencies to ensure that the health of the community is maintained. The mission of the DoH is to lead and deliver a comprehensive and sustainable health system that aims to ensure healthier, longer and better lives for all South Australians.

Key roles and suggested roles for DoH with regards to WSUD include:

- Working with other government agencies to encourage the safe (with regards to human health) implementation of water reuse schemes; and



- Developing awareness of WSUD related treated wastewater management requirements and responsibilities among their employees, stakeholders and contract partners.

### 5.1.9 Stormwater Management Authority

The Stormwater Management Authority (SMA) is responsible for implementing the Stormwater Management Agreement and operates as the planning, prioritising and funding body in accordance with the Stormwater Management Agreement.

The Authority supports floodplain mapping, preparation of stormwater management plans and priority stormwater infrastructure works on a catchment wide basis throughout South Australia.

Key roles for the SMA with regards to WSUD include:

- Issuing guidelines for the preparation of stormwater management plans;
- Assessing and approving stormwater management plans prepared by councils;
- Providing funding assistance towards stormwater management projects; and
- Developing awareness of WSUD related stormwater management requirements and responsibilities among employees, stakeholders and contract partners.

## 5.2 Local Government

Local government authorities have a major responsibility for land use planning and therefore have a significant ability to affect water management, through the design, construction and maintenance processes for the provision of local infrastructure.

Suitable consideration of water management during the locating and conceptual planning of urban, commercial and industrial areas has the potential to minimise many of the impacts of land development on water resources.

Local government planners can help protect water quality by ensuring that land to be developed is capable of sustaining urban development and follows the principles of WSUD to minimise the extent of impervious surfaces and provide adequate space for stormwater management and integrate stormwater quality treatment measures within public open space. New stormwater infrastructure should be designed to ensure that the impact of stormwater on receiving environments is minimal.

Local government and State Government agencies and utilities should develop an understanding of WSUD objectives and targets, and then integrate these into their strategic planning, infrastructure and construction activities. These organisations are also responsible for amending Development Plan policy and undertaking development assessment. The *Development Act 1993* provides the relevant council or the Minister for Urban Development and Planning with the legislative framework for undertaking amendments to a Development Plan.

Local government is responsible for the management of various parts of the built environment that may discharge directly into the stormwater system. These include local stormwater drains, roads, reserves, parks and car parks. Adopting leading management practices and environmental management approaches in regard to the operation and maintenance of these resources is an essential element for improved water management.

Key roles and suggested roles for local government with regard to WSUD include:

- Planning for new development and assessing development applications;
- Ensuring inclusion of WSUD objectives and principles in council Strategic Plans, Business Plans and Development Plans;
- Implementing total water cycle management principles as a requirement within new developments and redevelopment;
- Assessing and planning operational activities that have the potential to affect stormwater quality or quantity;
- Leading the development of stormwater management plans;
- Negotiating Land Management Agreements between local government and developers;
- Ensuring compliance with development approval conditions; and
- Helping identify opportunities to upgrade existing natural and built infrastructure to improve environmental performance.

## 5.3 Land Developers

To achieve the WSUD Framework targets, all new development should incorporate appropriate WSUD approaches and features. Land developers have a key role to play, particularly by integrating WSUD approaches early in the planning and design process to minimise costs and maximise outcomes, and also by identifying cost-effective WSUD innovations in design and construction.

## 5.4 Professional and Technical Advisors

There is a range of professional and technical advisors who are able to provide advice in relation to the use of WSUD principles and objectives. These advisors include, but are not limited to, engineers, architects, landscape architects and planners.

Key roles for professional and technical advisors with regards to WSUD include:

- Ensuring planning and design of new developments meet council and State Government policies and objectives;
- Ensuring water management infrastructure proposed in new and retrofitted developments, is innovative, cost-effective and meets WSUD objectives and targets; and
- Promoting awareness and understanding of WSUD objectives and principles to clients and to other professional and technical providers.

## 5.5 Builders and Development Owners

Development affects stormwater quality, during the construction period and as a result of the increased areas of impervious surfaces.

Managing runoff in a water sensitive manner not only helps prevent problems associated with stormwater up front, but can also enhance the social and environmental amenity of the landscape. Builders and development owners have an important role to play in the adoption of a water sensitive approach to urban planning, design and development.

Management of stormwater is crucial during construction, as soil is often removed and left exposed to erosion. Large sediment loads reaching receiving waters can be a consequence of poor site management. It is essential that construction activities are undertaken in such a way that contaminated runoff is not discharged off site.

The level of impact on water resources following construction depends on the site's specific land use and layout. By minimising impervious areas and using WSUD concepts, the impact of development on water resources can be minimised.

Builders and development owners should be responsible for taking on-site actions to achieve the targets and implementation measures set out in this Framework.

Key roles for the development industry include:

- Ensuring planning and design of new developments meet council and State Government policies and objectives;
- Ensuring water management infrastructure, proposed in new and retrofitted developments, is innovative, cost-effective and meets WSUD objectives and principles; and
- Encouraging demand for developments that meet WSUD objectives and principles.

## 5.6 Community

All members of the community have an interest in supporting the achievement of WSUD objectives. Opportunities for community involvement will need to be encouraged within the Implementation Plan for this project.

Lot-scale water management, reuse and conservation can have a significant impact on the quantity and quality of water resources. Individual consumer behaviour has the greatest impact on minimising water pollution, the volume of water consumed and the volume of runoff generated. Consumer demands also drive the urban development industry and influence design for land development.

Community awareness of the activities that they can undertake is heavily dependent on State Government and local government education and awareness programs.

Key roles for landowners, individuals and community groups include:

- Working with local governments and community groups;
- Developing an improved awareness of WSUD techniques;
- Ensuring that day-to-day activities protect and conserve water as a valuable resource; and
- Ensuring that activities do not contribute to the pollution of stormwater through applying leading practice.

## 6 Summary of Recommendations

The WSUD Framework and associated Technical Manual for the Greater Adelaide Region provide guidance regarding how to incorporate WSUD within existing and proposed developments, whether small or large-scale. The aim of the Framework is to promote the wide-spread adoption of WSUD to improve the health of the Greater Adelaide Region's waterways and water resources and to help protect against flooding.

The key long-term challenge for South Australia is to secure water supplies to match business, irrigation and household demands which flow from population and economic growth, while ensuring the long-term sustainability of its water resources and ecosystems. South Australia's approach to its future water infrastructure needs is underpinned by three themes:

- Sound management of existing resources;
- Responsible water use; and
- Fostering innovation and developing additional water supplies.

The supporting Technical Manual provides technical detail and support regarding implementation of such developments. In addition, a training module is being developed which will be used to increase education and awareness in relation to WSUD. Over time, each of these components will require updating and improvement.

During the development of the WSUD Framework, a number of recommendations were proposed which require actions by a variety of organisations in the short, medium and long term, which are summarised in **Table 6.1**. It should be noted that the recommendations are not listed in priority order.



**Table 6.1 Recommendations to Improve the Implementation of WSUD**

| Item                                   | Recommendation   | Responsible Agency   |
|--|--|--|
| <b>Establishment of Targets</b>        |  |  |
| Recommendation 1                       | Adoption of the WSUD baseline targets  | State Government agencies, local government, DPLG (formerly Office for State Local Government Relations), Local Government Association |
| <b>Strategic and Business Planning</b> |  |  |
| Recommendation 2                       | Future reviews and alterations to relevant State Government strategies and plans (e.g. 2009 Planning Strategy) have regard to the WSUD Framework to formalise WSUD as a mainstream approach in all urban areas and activities  | DPLG (formerly Planning SA) to coordinate with State Government agencies   |
| Recommendation 3                       | Local government Strategic Plans and Infrastructure and Asset Management Plans adopt WSUD principles and targets to support the achievement of WSUD objectives   | Local government, NRM Boards, DPLG (formerly Office for State Local Government Relations)  |
| Recommendation 4                       | Communicate with State Government agencies to encourage the implementation of WSUD through actions consistent with the State Natural Resources Management Plan, as required under the <i>Natural Resources Management Act 2004</i>   | DWLBC  |
| <b>Stormwater Management Plans</b>     |  |  |
| Recommendation 5                       | (a) Amend the Stormwater Management Planning Guidelines to require relevant catchment-scale targets to be developed during the development of Stormwater Management Plans<br><br>(b) Amend the Stormwater Management Planning Guidelines to require Stormwater Management Plans to demonstrate how the actions in the plan contribute to achieving | Stormwater Management Authority in conjunction with the NRM Council and Office for Water Security                                      |

| Item   | Recommendation   | Responsible Agency   |
|--|--|--|
|  | relevant Regional Natural Resources Management Plan targets<br><br>(c) Strengthen the Stormwater Management Planning Guidelines to more specifically require demonstration of integration of Stormwater Management Plan recommendations into day-to-day local government planning activities (policy and assessment) |  |
| <b>Works on Local and State Government Roads</b> |  |  |
| Recommendation 6                                 | Amend the DTEI <i>Protecting Waterways Manual</i> to define water quality targets in accordance with WSUD baseline targets, where appropriate  | Department for Transport Energy and Infrastructure   |
| <b>Development System</b>                        |  |  |
| Recommendation 7                                 | Include WSUD baseline targets within the Planning Strategy.  | DPLG (formerly Planning SA)  |
| Recommendation 8                                 | Finalise the incorporation of WSUD principles within the Better Development Plan (BDP) policy modules  | DPLG (formerly Planning SA)  |
| Recommendation 9                                 | Undertake a Ministerial DPA to assist with the adoption of BDP policy modules throughout the Greater Adelaide Region which incorporate WSUD principles   | DPLG (formerly Planning SA)  |
| <b>Development Assessment</b>                    |  |  |
| Recommendation 10                                | Undertake further investigations regarding the potential to vary Schedule 5 of the Development Regulations 2008 to outline the type of information pertaining to achieving WSUD objectives that must be included in particular types of development applications   | DPLG (formerly Planning SA)  |
| Recommendation 11                                | Initiate the use of checklists which outline the process to consider WSUD principles and which document how targets have been achieved   | DPLG (formerly Planning SA and Office for State Local Government Relations) and Local Government Association |

| Item  | Recommendation   | Responsible Agency  |
|---|--|---|
| Recommendation 12                             | Investigate the implications of amending the Housing Code to include relevant WSUD measures  | DPLG (formerly Planning SA) in conjunction with Housing Industry Association, Urban Development Institute of Australia, Master Builders Association, and Housing SA   |
| Recommendation 13                             | Investigate the opportunities and costs associated with the establishment of a Water Recovery Fund.  | Office for Water Security   |
| <b>Communication of WSUD Planning Process</b> |  |   |
| Recommendation 14                             | Ensure the information within the Framework and Technical Manual is readily accessible to people who are seeking development approval and who are assessing development  | DPLG (formerly Planning SA), local government, Local Government Association, Urban Development Institute of Australia, Department for Transport, Energy and Infrastructure, Stormwater Management Authority |
| <b>Other Statutory Approvals Processes</b>    |  |   |
| Recommendation 15                             | Natural Resources Management Boards to liaise with stakeholders to ensure consistency and encourage clarity in relation to permits and approvals for 'water affecting activities' ( <i>Natural Resources Management Act 2004</i> ) | Natural Resources Management Boards   |
| Recommendation 16                             | Investigate the opportunities for amendment of the Environment Protection (Water Quality) Policy 2003 and relevant Codes of Practice to ensure that WSUD objectives and targets are incorporated                                   | Environment Protection Authority  |
| Recommendation 17                             | Investigate the potential to apply relevant WSUD principles to any new approval granted in relation to land developments and connection to water supply and sewerage infrastructure owned by SA Water                              | SA Water  |

| Item                            | Recommendation   | Responsible Agency  |
|---------------------------------|--|---|
| Recommendation 18               | WSUD objectives and principles be incorporated in SA Water's Mains Extension Policy, where appropriate.  | SA Water  |
| Recommendation 19               | Review the rating system for connections to the mains supply and sewerage infrastructure to determine if there are opportunities for amendment to assist the future implementation of WSUD principles  | SA Water  |
| Recommendation 20               | Review the Public and Environmental Health (Waste Control) Regulations 1995 to ensure that they do not inhibit the application of WSUD principles while upholding public health requirements   | Department of Health, Local Government Association and Environment Protection Authority   |
| <b>Training and Development</b> |  |   |
| Recommendation 21               | Develop and fund coordinated WSUD education and awareness activities on an annual basis with yearly review to assess effectiveness   | DPLG (formerly Planning SA) to coordinate   |
| <b>Action Plan</b>              |  |   |
| Recommendation 22               | <p>(a) Develop a WSUD Action Plan which outlines how each of the recommendations is going to be achieved within specified timeframes.</p> <p>(b) Monitor and report on the Action Plan's progress in implementing specific recommendations</p> | <p>(a) Each responsible agency to develop an Action Plan for WSUD implementation</p> <p>(b) Office for Water Security to coordinate</p> |

## APPENDIX A

### Summary of South Australian Legislation and Strategies Relevant to the Implementation of WSUD in South Australia

| South Australia's Strategic Plan (2007)                 |  |  |   |
|---|--|--|---|
| Responsible Agency                                      | State Legislation  | State Strategies   | Plans, Policies and Codes   |
| Department of Planning and Local Government             | <ul style="list-style-type: none"> <li>Development Act 1993</li> <li>Development Regulations 2008</li> </ul>   | <ul style="list-style-type: none"> <li>Planning Strategy</li> <li>Metropolitan Adelaide Industrial Land Strategy (2007)</li> </ul> | <ul style="list-style-type: none"> <li>Development Plans</li> <li>Rainwater Tank Policy</li> </ul>  |
| Department of Trade and Economic Development            |  | <ul style="list-style-type: none"> <li>Metropolitan Adelaide Industrial Land Strategy (2007)</li> </ul>                            |   |
| Local government  | <ul style="list-style-type: none"> <li>Local Government Act 1999</li> </ul>  |  | <ul style="list-style-type: none"> <li>Council Strategic Plans</li> <li>Business Plans</li> <li>Infrastructure and Asset Management Plans</li> <li>Stormwater Management Plans</li> </ul> |
| Stormwater Management Authority                         | <ul style="list-style-type: none"> <li>Local Government (Stormwater Management) Amendment Act 2007</li> </ul>  |  | <ul style="list-style-type: none"> <li>Stormwater Management Planning Guidelines</li> </ul>   |
| Department of Water, Land and Biodiversity Conservation | <ul style="list-style-type: none"> <li>Natural Resources Management Act 2004</li> <li>River Murray Act 2003</li> </ul>   | <ul style="list-style-type: none"> <li>Water Proofing Adelaide (2005–2025)</li> </ul>  |   |
| Natural Resources Management Council                    |  |  | <ul style="list-style-type: none"> <li>State Natural Resources Management Plan (2006)</li> </ul>  |
| Natural Resources Management Boards                     | <ul style="list-style-type: none"> <li>Natural Resources Management Act 2004</li> <li>River Murray Act 2003</li> <li>Natural Resources Management (Central Adelaide Prescribed Wells Area) Regulations 2007</li> </ul> |  | <ul style="list-style-type: none"> <li>Regional Natural Resources Management Plans</li> <li>Water Allocation Plans</li> </ul>   |



| South Australia's Strategic Plan (2007)             |   |  |   |
|---|---|--|---|
| Responsible Agency                                  | State Legislation   | State Strategies   | Plans, Policies and Codes   |
| Environment Protection Authority                    | <ul style="list-style-type: none"> <li>Environment Protection Act 1993</li> </ul>   | <ul style="list-style-type: none"> <li>EPA Strategic Plan</li> </ul>   | <ul style="list-style-type: none"> <li>Environment Protection (Water Quality) Policy (2003)</li> <li>Adelaide Coastal Water Quality Improvement Plan (draft)</li> <li>Code of Practice for Stormwater</li> <li>Code of Practice for Managed Aquifer Recharge</li> </ul> |
| SA Water  | <ul style="list-style-type: none"> <li>South Australian Water Corporation Act 1994</li> <li>Waterworks Act 1932</li> <li>Sewerage Act 1929</li> <li>Metropolitan Drainage Act 1935</li> </ul> | <ul style="list-style-type: none"> <li>Water Proofing Adelaide (2005 – 2025)</li> </ul>  |   |
| Department for Transport, Energy and Infrastructure | <ul style="list-style-type: none"> <li>Highways Act 1926</li> </ul>   |  | <ul style="list-style-type: none"> <li>Strategic Infrastructure Plan for South Australia (2005 – 2014)</li> </ul>   |
| Department of Health                                | <ul style="list-style-type: none"> <li>Public and Environmental Health Act 1987</li> </ul>  | <ul style="list-style-type: none"> <li>SA Health Strategic Plan (2007 – 2009)</li> </ul>                                       |   |
| Department of Premier and Cabinet                   | <ul style="list-style-type: none"> <li>Climate Change and Greenhouse Emissions Reduction Act 2007</li> </ul>  | <ul style="list-style-type: none"> <li>Tackling Climate Change, South Australia's Greenhouse Strategy (2007)</li> </ul>        |   |
| Department for Families and Communities             |   | <ul style="list-style-type: none"> <li>Strategic Agenda for the Department for Families and Communities (2005–2008)</li> </ul> | <ul style="list-style-type: none"> <li>Housing Plan for South Australia (2005)</li> </ul>   |

## APPENDIX B

### South Australian Legislation, Policies, Strategies and Codes related to Particular Water Resources

#### Roof Runoff

Water resources in South Australia are primarily managed under the *Natural Resources Management Act 2004*. Where increased development causes stress on water resources and a higher level of management is warranted, the associated water resources can be prescribed under the *Natural Resources Management Act 2004*.

Any rain that falls on a roof is considered to be surface water. A water licence is required to 'take' surface water in an area where surface water is prescribed, such as the Western Mt Lofty Ranges. Exemptions where no licence is required include for:

- Stock and domestic purposes;
- Fire fighting;
- Chemical use on non-irrigated crops, non-irrigated pasture and for the control of pest plants and animals;
- Road making; and
- Specific exemption (see below).

Roof runoff that is not 'taken' (collected and used) returns to the environment and does not require licensing.

Commercial, industrial, environmental and recreational users are currently exempt from requiring a water licence to take roof runoff where the volume of water collected from the connected roof area is equal to or less than 500 kilolitres per year.

#### Groundwater

Under the *Natural Resources Management Act 2004* prescription occurs when urban or regional development issues place stress on water resources, warranting a higher level of management than in other areas. In these areas a licence is required before water can be taken for irrigation or other purposes. In the Prescribed Wells Areas, a specific volume of groundwater is allocated for consumptive use through the water allocation planning process. There are currently four prescribed wells areas in the Greater Adelaide Region:

- Central Adelaide Prescribed Wells Area;
- Northern Adelaide Plains Prescribed Wells Area;
- Barossa Prescribed Water Resources Area; and
- McLaren Vale Prescribed Wells Area.

The water resources of the Eastern Mt Lofty Ranges were prescribed in September 2005 and those of the Western Mt Lofty Ranges in October 2005.

A proposed managed aquifer recharge (MAR) (or aquifer storage and recovery (ASR)) scheme needs to meet the requirements of three pieces of legislation:

- *Development Act 1993*;
- *Environment Protection Act 1993*; and
- *Natural Resources Management Act 2004*.

Certain activities – whether development or not – require a licence granted under the *Environment Protection Act 1993*. The discharge of stormwater from stormwater infrastructure (from areas greater than 1 hectare) to underground aquifers in the metropolitan Adelaide region is presently an activity specifically requiring a licence (Schedule 1, 4(2) of the Act). It should be noted that there is no provision in the licence for extraction of the water. In determining a licence application, the Environment Protection Authority (EPA) must have regard to specified matters, including the provisions of the Environment Protection (Water Quality) Policy 2003. The Code of Practice for Aquifer Storage and Recovery (2004) outlines the requirements of the EPA for the storage of waters in aquifers.

The EPA may issue an authorisation in the form of a licence to operate an aquifer storage and recovery (ASR) scheme once development approval has been granted from the local planning authority under the *Development Act 1993*. To obtain an EPA licence for ASR, the proponent must also obtain a well construction permit from the Department of Water, Land and Biodiversity Conservation (DWLBC) for any proposed wells that will intersect the water table.

If groundwater is to be extracted from the aquifer, the proponent must also obtain a licence from DWLBC to extract water as required by the *Natural Resources Management Act 2004*.

Many MAR schemes will not need a licence from the EPA. DWLBC licenses the discharge of stormwater to underground aquifers wherever an EPA licence is not required under the Act.

## Wastewater

The Environment Protection (Water Quality Policy) 2003 establishes thresholds above which it is an offence to discharge wastewaters to a water resource. This policy provides the legislative controls (*Environment Protection Act 1993*) to bring about improvements in the management of wastewaters, of which one method is the application of wastewater to a beneficial use.

The South Australian Reclaimed Water Guidelines (April 1999) describes methods by which reclaimed water can be used in a sustainable manner without imposing undue risks to public health or the environment. Any wastewater reuse projects should need

to be undertaken in accordance with the National Environment Protection Council's Australian Water Recycling Guidelines. The guidelines include a risk-based approach to the reuse and recycling of wastewater and greywater from large-scale centralised treatment facilities for use in residential garden watering, car washing, toilet flushing and clothes washing, irrigation of public open space, agriculture and horticulture, fire protection and fire fighting systems.

Permanent greywater systems such as diversion devices or treatment systems require installation approval from council or the Department of Health and all systems must be installed by a licensed plumber. Installation of greywater systems must take into account the Department of Health requirements for setback distances outlined in the South Australian Health Commission Code Waste Control Systems – Standard for Construction, Installation and Operation of Septic Tank Systems in South Australia and Supplement B – Aerobic Wastewater Treatment Systems.





## APPENDIX C

### Planning Process for Water Sensitive Urban Design

**Table C1** provides an outline of the opportunities that are available within the existing design and regulatory processes for incorporating WSUD into proposed developments or activities.

As discussed in this document, some activities are considered to be 'development' as defined under the *Development Act 1993* and require development approval, usually from the relevant council. Other activities, which might not require development approval, may require some approvals from State Government agencies depending on the WSUD measure which is proposed. However, the overall design process is similar for both.

**Table C1 Existing Process for Implementing WSUD**

| Stages   | Key WSUD Considerations  |
|--|--|
| Initial concept or idea  | <p>Be aware of need to achieve WSUD targets within development or activity</p> <p>Identify any existing or proposed WSUD targets which may be applicable in this location</p>  |
| Consider relevant provisions of the Development Plan and legislation   | <p>Contact local council to establish requirements in relation to WSUD</p> <p>Identify whether development approval is likely to be required</p> <p>Refer to local council's Stormwater Management Plan</p> <p>Identify other types of government approvals which might be necessary</p>   |
| Review physical properties of the site and identify specific constraints   | <p>Consider constraints and opportunities in relation to achieving WSUD targets</p> <p>Considerations might include slope, soil type, size of property, nature of development or activity, sub-catchment/catchment/and regional water quality and water quantity targets, other factors such as siting to maximise energy efficiency, biodiversity etc</p> |
| Identify which WSUD measures are considered suitable for inclusion in the development (land division scale and/or allotment scale) | <p>Consider how to use measures to achieve proposed baseline targets for WSUD as identified in this Framework</p>  |

| Stages   | Key WSUD Considerations   |
|--|---|
| Consult with council and other relevant authorities                  | <p>Identify opportunities to enhance achievement of WSUD within proposed development or activity</p> <p>Identify requirements of council in relation to level of information to be provided in support of development application</p> <p>Identify other approval requirements from State Government agencies</p>  |
| Develop an appropriate layout  | <p>Refer to <b>Chapter 3</b> of the WSUD Technical Manual for the Greater Adelaide Region to assist with the design process for WSUD</p> <p>Seek professional advice in relation to the WSUD aspects of the site layout if needed</p> <p>For larger developments, including subdivisions, undertake analysis of pre-development and post-development flows (volume, quality and frequency) from the site</p>  |
| Undertake formal approvals process                                   | <p>Seek development approval if required</p> <p>Seek other government approvals that might be necessary, depending on type and nature of WSUD measures which are being proposed</p>   |
| Undertake detailed design  | <p>Ensure WSUD objectives are communicated to design professionals, including architects, building designer, engineers etc</p> <p>Seek professional advice in relation to the WSUD aspects of the site layout if needed</p>   |
| Plan and undertake construction and operation and maintenance phases | <p>Prepare a soil erosion and drainage management plan (SEDMP) if undertaking a subdivision.</p> <p>Note: The Stormwater Pollution Prevention Code for the Building and Construction industry, under the Environment Protection (Water Quality) Policy 2003, requires a SEDMP to be prepared where:</p> <ul style="list-style-type: none"> <li>▪ There is a high risk of sediment pollution to adjoining land or receiving waters, or</li> <li>▪ The total area to be disturbed, or left disturbed, at any one time exceeds 0.5 hectares</li> </ul> <p>Develop appropriate measures for ongoing operation and maintenance of WSUD elements of the development or activity</p> |
| Ensure adherence to development approval conditions                  | <p>Conditions of development approval are enforceable under the <i>Development Act 1993</i>.</p>  |

## Design Process for Water Sensitive Urban Design

A five-step process has been developed to assist with the design, development and assessment of WSUD projects as outlined in **Table C2**.

These steps are a useful guide which can be applied to all scales of activities and developments, from the smallest residential retrofitting through to subdivision design and construction.

**Table C2 Design Process for WSUD**

| Five Steps to Water Sensitive Urban Design  |
|---|
| <b>Step 1: Find ways to reduce water consumption</b> <ul style="list-style-type: none"> <li>■ Undertake a water consumption audit</li> <li>■ Set water saving targets</li> <li>■ Install measures to reduce the demand for water</li> </ul>   |
| <b>Step 2: Replace potable water with another water source</b> <ul style="list-style-type: none"> <li>■ Review the available water sources</li> <li>■ Consider opportunities for rainwater and stormwater harvesting and reuse</li> <li>■ Consider opportunities for greywater and blackwater treatment and reuse</li> </ul>  |
| <b>Step 3: Treat runoff before discharge</b> <ul style="list-style-type: none"> <li>■ Review how much and where runoff discharges from the site</li> <li>■ Set (or adopt) water quality and quantity targets</li> <li>■ Determine pollutant loads and runoff treatment measures that may be applicable to meet targets</li> </ul>   |
| <b>Step 4: Approvals, design and modelling needed for WSUD</b> <ul style="list-style-type: none"> <li>■ Consider water management in the broader environment (urban design, public safety, health, heritage, greenhouse)</li> <li>■ Consider who will manage the asset in the long-term</li> <li>■ Applications relevant to development scale</li> <li>■ Modelling and design</li> <li>■ Approvals</li> </ul> |
| <b>Step 5: Undertake maintenance and evaluation</b> <ul style="list-style-type: none"> <li>■ Develop a maintenance plan and routinely undertake maintenance</li> <li>■ Evaluation</li> </ul>  |



## APPENDIX D

### References

Allen, M. D., Argue, J. D., Geiger, W. F., Johnston, L. D., Pezzaniti, D., Scott, P. (2005). *Water Sensitive Urban Design: Basic Procedures for Source Control of Stormwater*. Urban Water Resources Centre University of South Australia, Stormwater Industry Association, Australian Water Association. Adelaide, South Australia.

CSIRO (2007). *The Adelaide Coastal Water's Study: Final Report Volume 1 Summary of Findings*. Prepared for the South Australian Environment Protection Authority. Adelaide. November. [http://www.epa.sa.gov.au/pdfs/acws\\_report.pdf](http://www.epa.sa.gov.au/pdfs/acws_report.pdf).

Department for Transport Energy and Infrastructure SA (2007). *Infrastructure in South Australia: Five Yearly Report to the Council of Australian Governments*. Government of South Australia. February. [http://www.coag.gov.au/meetings/130407/docs/infrastructure\\_reports\\_sa.pdf](http://www.coag.gov.au/meetings/130407/docs/infrastructure_reports_sa.pdf).

Department of Water Land and Biodiversity Conservation (2006). *State Natural Resources Management Plan*. Adelaide.

Environment Protection Authority South Australia (2004). *Ambient Water Quality of the Gulf St Vincent Metropolitan Coastal Waters. Report No. 2: 1995-2002*. Adelaide. January. [http://www.epa.sa.gov.au/pdfs/gulf\\_stvincent.pdf](http://www.epa.sa.gov.au/pdfs/gulf_stvincent.pdf).

Government of South Australia (2007). *South Australia's Strategic Plan*. <http://www.saplan.org.au/>

Government of South Australia (2006). *Planning Strategy for Metropolitan Adelaide and Planning Strategy for Outer Metropolitan Adelaide*. <http://www.planning.sa.gov.au/go/strategy/land-use-planning-strategy-for-sa>

Government of South Australia (2005). *Water Proofing Adelaide: A Thirst for Change (2005 - 2025)*. <http://www.waterproofingadelaide.sa.gov.au/WPA/Publications/>

IE Aust. (2006). *Australian Runoff Quality: A Guide to Water Sensitive Urban Design*. New South Wales.

SA Water (2006). *Annual Report 2005-2006*. [http://www.sawater.com.au/NR/rdonlyres/88AB3B1B-B264-4B72-90F6-79368B434BB6/0/SA\\_Water\\_FullAnnualReport\\_2006.pdf](http://www.sawater.com.au/NR/rdonlyres/88AB3B1B-B264-4B72-90F6-79368B434BB6/0/SA_Water_FullAnnualReport_2006.pdf).





## APPENDIX E

**Table E1 Useful Links**

| Description  | Website Link   |
|--|--|
| Alternative Technology Association   | <a href="http://www.ata.org.au">www.ata.org.au</a>   |
| Australian Water Association (AWA)   | <a href="http://www.awa.asn.au">www.awa.asn.au</a>   |
| Australian Guidelines for Water Recycling  | <a href="http://www.ephc.gov.au/ephc/water_recycling.html">www.ephc.gov.au/ephc/water_recycling.html</a>   |
| Sponsored by Yarra Valley Water and RMIT Centre for Design   | <a href="http://www.savewater.com.au">www.savewater.com.au</a>   |
| Department for Transport, Energy and Infrastructure  | <a href="http://www.dtei.sa.gov.au/index.html">www.dtei.sa.gov.au/index.html</a>   |
| Department of Water, Land and Biodiversity Conservation  | <a href="http://www.dwlbc.sa.gov.au/">www.dwlbc.sa.gov.au/</a>   |
| Environment Protection Authority   | <a href="http://www.epa.sa.gov.au">www.epa.sa.gov.au</a>   |
| Green plumber association  | <a href="http://www.greenplumbers.com.au">www.greenplumbers.com.au</a>   |
| International Water Association (IWA)  | <a href="http://www.iwahq.org.uk">www.iwahq.org.uk</a>   |
| Local Government Association   | <a href="http://www.lga.sa.gov.au/site/page.cfm">www.lga.sa.gov.au/site/page.cfm</a>   |
| National guidelines for evaluating water sensitive urban development (expected to be available by late 2008) | <a href="http://www.nwc.gov.au/publications/index.cfm">www.nwc.gov.au/publications/index.cfm</a>   |
| National Water Quality Management Strategy Guidelines  | <a href="http://www.environment.gov.au/water/quality/nwqms/index.html">www.environment.gov.au/water/quality/nwqms/index.html</a>   |
| Natural Resource Management Boards   | <a href="http://www.dwlbc.sa.gov.au/nrm/topics/boards.html">www.dwlbc.sa.gov.au/nrm/topics/boards.html</a>   |
| Department of Planning and Local Government (formerly Planning SA)   | <a href="http://www.planning.sa.gov.au">www.planning.sa.gov.au</a>   |
| Rainwater tank requirements  | <a href="http://www.planning.sa.gov.au/go/building/sustainability-and-efficiency/rainwater-tanks/rainwater-tanks">www.planning.sa.gov.au/go/building/sustainability-and-efficiency/rainwater-tanks/rainwater-tanks</a> |

| Description  | Website Link   |
|--|--|
| South Australia's Strategic Plan and supporting documents and comments | <a href="http://www.saplan.org.au">www.saplan.org.au</a>   |
| Stormwater Industry Association of South Australia                     | <a href="http://www.stormwater.asn.au/sa/">www.stormwater.asn.au/sa/</a>   |
| Stormwater Management Authority  | <a href="http://www.lga.sa.gov.au/goto/sma">www.lga.sa.gov.au/goto/sma</a>   |
| Sustainable Gardening Australia  | <a href="http://www.sgaonline.org.au">www.sgaonline.org.au</a>   |
| Sustainable Landscapes Project   | <a href="http://www.environment.sa.gov.au/botanicgardens/sustainable.html">www.environment.sa.gov.au/botanicgardens/sustainable.html</a>   |
| Tackling Climate Change in South Australia                             | <a href="http://www.climatechange.sa.gov.au">www.climatechange.sa.gov.au</a>   |
| Wastewater systems approval  | <a href="http://www.dh.sa.gov.au/pehs/branches/wastewater">www.dh.sa.gov.au/pehs/branches/wastewater</a>   |
| Water Proofing Adelaide  | <a href="http://www.waterproofingadelaide.sa.gov.au/WPA">www.waterproofingadelaide.sa.gov.au/WPA</a>   |
| Water restrictions information   | <a href="http://www.sawater.com.au/SAWater/Environment/WaterRestrictionsConservationMeasures/">www.sawater.com.au/SAWater/Environment/WaterRestrictionsConservationMeasures/</a> |
| Water Services Association of Australia                                | <a href="http://www.wsaa.asn.au">www.wsaa.asn.au</a>   |