

# Introduction to Water Sensitive Urban Design in Sydney

This fact sheet has been produced by the Water Sensitive Urban Design (WSUD) Program to provide overview of WSUD concepts and supporting information.

## The impact of urbanisation on the water cycle

Urban development has a significant impact on the natural environment by altering the water cycle and transporting pollution to waterways. The main impacts include:

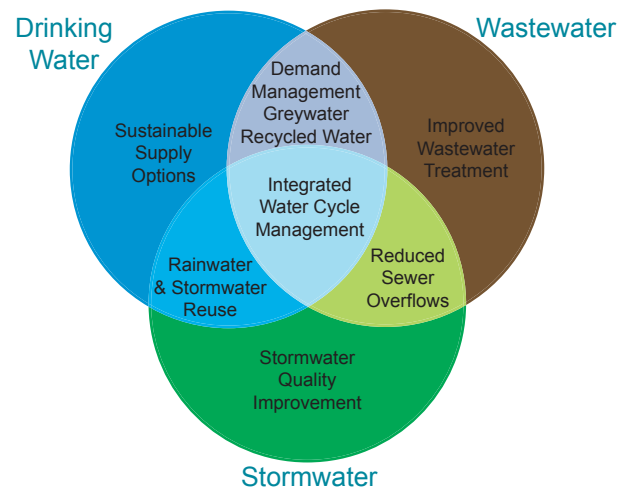
- hard surfaces such as roofs, roads and footpaths, increase the volume and speed of stormwater, causing physical and ecological impacts on natural waterways and wetlands.
- urbanisation generates pollutants which are carried in stormwater runoff during rain events. High loads of gross pollutants, suspended solids, nutrients and heavy metals all impact negatively on aquatic ecosystems.
- large amounts of drinking water are imported from external catchments. Transport, treatment, storage and distribution are costly and the recent drought has highlighted the limitations of drinking water supplies.
- large amounts of wastewater are generated and discharged to oceans and rivers, polluting receiving waters.

In the Sydney Region there are between 80-100 rainfall events in an average year. Under natural conditions this rainfall would typically cause stormwater runoff in about ten of these events, with the remaining water infiltrating naturally into the ground. Urbanisation disrupts this nature cycle, and increases the number of rainfall events that generate stormwater.

## Water Sensitive Urban Design

WSUD seeks to ensure that urban development and urban landscapes are designed, constructed and maintained in a manner that minimises the impacts on the urban water cycle – drinking water, wastewater, stormwater, and groundwater.

WSUD elements relating to the urban water cycle are illustrated in Figure 1, whereby action in one sphere can have dual benefits. For example, demand management reduces the amount of drinking water consumed by a household, as well as reducing the amount of wastewater generated, and therefore treated.



**Figure 1: Integrated Management of the Urban Water Cycle and WSUD (Hoban and Wong 2006).**

## WSUD Principles

WSUD principles seek to minimise the impact of urbanisation on the natural water cycle, and include:

- protecting and enhancing the natural aspects of landscapes, enabling the reconnection of built and natural forms.
- treating urban stormwater to best practice standards for reuse and/or discharge to receiving waters.
- reducing drinking water demand through water efficiency, stormwater harvesting and wastewater reuse.
- minimising wastewater generation and treatment of wastewater so that it can be reused and/or discharged with less impact on our rivers and oceans.
- integrating vegetated stormwater treatment and harvesting systems into the landscape, so as to provide micro-climate benefits which can reduce the urban heat island effect.



## WSUD Elements

There are a range of WSUD elements which can be used to meet WSUD targets adopted by council, including:

- reuse of rainwater, stormwater or treated effluent for toilet flushing, washing machines, garden watering, car washing or industrial purposes.
- vegetated stormwater treatment systems such as bioretention systems, swales and wetlands as illustrated in the schematics and examples below.

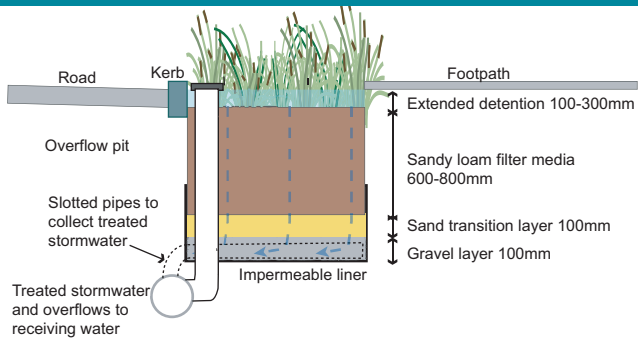
WSUD can be applied at all development scales from small (single house or apartments) to larger commercial, industrial and greenfield subdivisions. WSUD elements can also be retrofitted into existing buildings, incorporated into upgrades or replacements of existing infrastructure (e.g. council works such as road and park upgrades), alterations and additions to new houses and capital works of council.

## WSUD Benefits

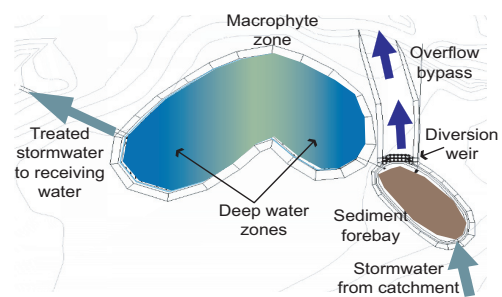
While WSUD aims to minimise the impact of urbanisation on the water cycle, it delivers a range of other benefits:

- introducing vegetated water treatment systems into the landscape can influence micro-climates and reduce the urban heat island effect.
- vegetated treatment systems provide green infrastructure and green links to improve the look, function and recreational value of our cities.
- road upgrades and/or traffic calming which include WSUD features can reduce stormwater loadings.
- stormwater and wastewater reuse for council infrastructure such as sports ovals provide insurance against water scarcity and water restrictions.
- reduced need for rehabilitation and maintenance of waterways.

### Schematics of a bioretention system and wetland



**Cross-section of a bioretention system**

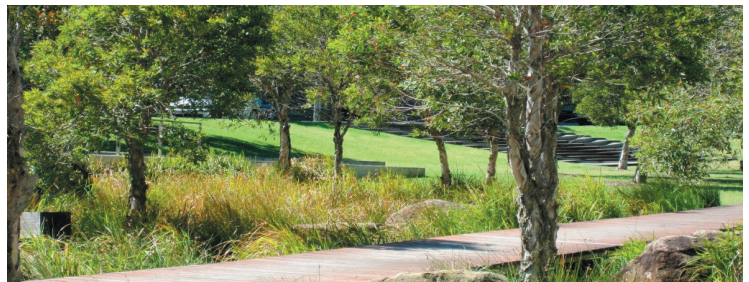


**Plan view of a wetland**

### Examples of WSUD in Sydney

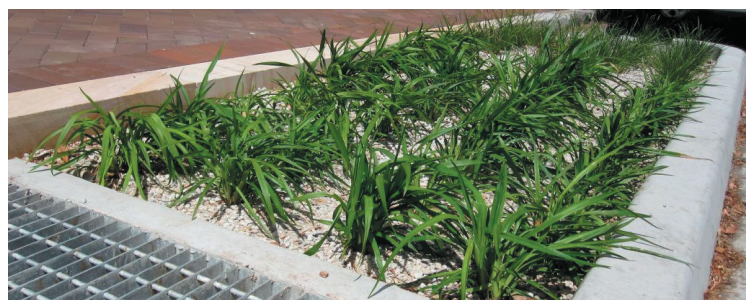


Through the renewal of building and open space areas, Sydney University has installed 11 bioretention systems, a wetland and 4 storage tanks with 400kL of reuse capacity for irrigation and toilet flushing.



The importance and significance of incorporating WSUD elements into the planning of their Victoria Park development led to Landcom formulating its WSUD Policy and mandating that all Landcom projects incorporate WSUD.

Marrickville Council is identifying locations for WSUD through a sub-catchment planning process. As a result Council has retrofitted a series of streets and parking bays with WSUD elements.



The City of Sydney is retrofitting its parks and streets to include WSUD to treat stormwater to protect Sydney Harbour and for reuse. The projects are designed to meet WSUD targets established by Council - see Sustainable Sydney 2030.