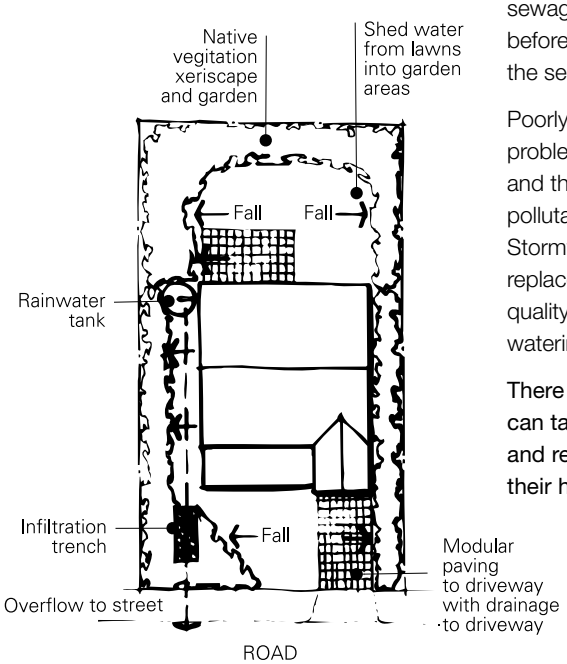
Stormwater

Stormwater is pure rainwater plus anything the rain carries along with it. Stormwater should be considered a valuable resource. Its re-use leads to water savings and reduced environmental impact.



In urban areas stormwater is generated by rain runoff from roof, roads, driveways, footpaths and other impervious or hard surfaces. In Australia the stormwater system is separate from the sewer system. Unlike sewage, stormwater is generally not treated before being discharged to waterways and the sea.

Poorly managed stormwater can cause problems on and offsite through erosion and the transportation of nutrients, chemical pollutants and sediments to waterways. Stormwater is a useful resource that can replace imported water for uses where high quality water is not required, such as garden watering.

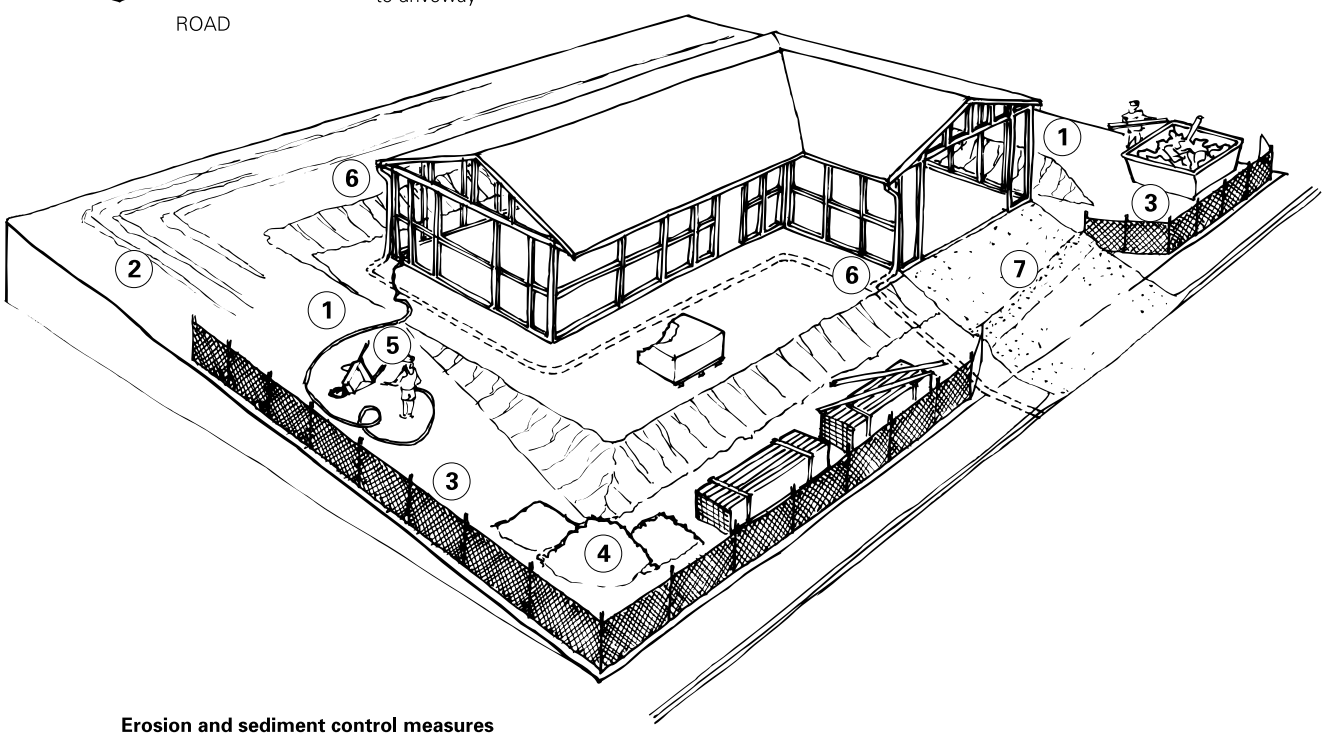
There are a number of steps the homeowner can take to better manage stormwater, and reduce the environmental impact of their home.

Avoid cut and fill on your block when preparing the building foundations. Attempt to maintain the existing topography and drainage pattern.

Retain vegetation, particularly deep-rooted trees. These lower the water table, bind the soil, filter nutrients, decrease run-off velocities, capture sediment and reduce the potential for dryland salinity.

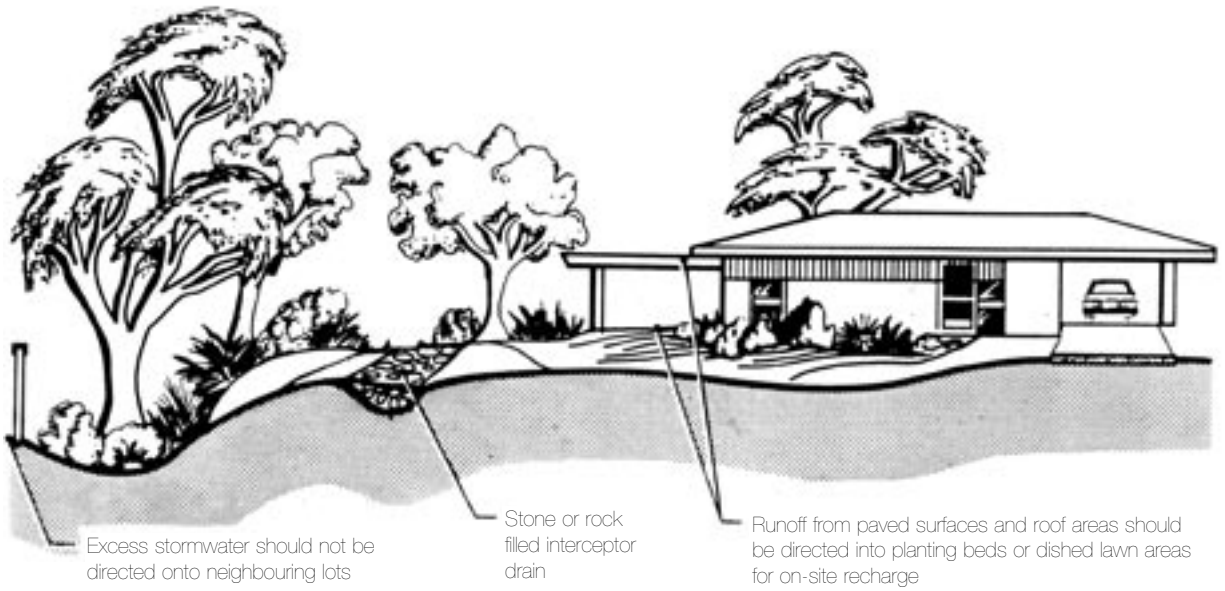
Detain stormwater on your block where practicable through use of permeable paving, pebble paths, infiltration trenches, soakwells, lawn, garden areas and swales.

Reduce erosion potential on site during building works by minimising the time that land is left in an exposed, unstable condition. Employ sediment traps and divert 'clean' stormwater around the disturbed site. [See: Sediment Control]



Erosion and sediment control measures

1 Minimise disturbance
2 Diversion devices
3 Sediment barriers
4 Secure stockpiles
5 Other containments
6 Early stormwater connection
7 Controlled access point



Minimise the area of impervious surfaces such as paved areas, roofs and concrete driveways.

Grade impervious surfaces, such as driveways, during construction to drain to vegetated areas.

Harvest and store roof water for use. [See: Rainwater]

Reduce pollution resulting from fertiliser, herbicide and pesticide application. Do not over-use products. Follow the manufacturer's instructions regarding amount and frequency of application. Look for organic alternatives.

Avoid the use of solvent based paints. When using water based paints, clean brushes and equipment on a lawn area to trap contaminants before they reach waterways. Plant based paints are the most environmentally benign.

Visit a car wash that recycles detergent. If this is not an option wash your car on the lawn or on an area that drains to lawn. The nutrients (mostly phosphates and nitrates) in the detergent fertilise the lawn instead of degrading waterways. Note that many native plants do not tolerate detergents.

Do not build on flood plains as the land may be periodically subject to inundation and may possess a high water table. Councils can advise on the 1 in 100 year flood level.

THE TRADITIONAL APPROACH

Pipes

The traditional stormwater management response relied on conveyancing. Water was conveyed by a pipe or channel from a collection area to a discharge point. The collection area is your house or street and the discharge point is the nearest ocean, river or lake. The coveyancing system sought to remove the most water (high quantity) from a site in the shortest time possible (high velocity). Large, impervious paved areas and big pipes are typical of coveyancing.

The traditional system of conveyancing is highly effective in reducing stormwater nuisance and flooding on site, unless the pipes get blocked. Conveyancing does not solve the problem but merely transfers it to the other end of the pipe and ultimately upsets the local water balance. Stormwater is carried rapidly with its suspended litter, oil, sediment and nutrients and dumped in an ocean, river or lake. The receiving waterbody then becomes flooded and temporarily polluted because all the stormwater arrives at one time.

WATER SENSITIVE URBAN DESIGN

Water Sensitive Urban Design (WSUD) is a storage-orientated system that provides for temporary retention of stormwater on site. WSUD seeks to approximate the natural water balance on-site prior to the land being built on. It achieves this by slowing the water velocity of stormwater run-off, providing natural filtration, storage and infiltration. The water eventually reaches the river, lake or ocean but has been cleaned and filtered by the soil and used by plants before it gets there.

The objective is to minimise impervious surfaces so that the least amount of water flows off-site into the stormwater system. At the scale of the individual housing lot, WSUD uses permeable paving, infiltration trenches, soakwells, lawn, garden areas and swales to detain the water and allow it to percolate into the soil. The slope of the block and the depth and type of soil determine the application of each of these practices. Council can advise on the suitability of each method.

Water Sensitive Urban Design provides the improved aesthetics and comfort associated with more vegetation. Habitat for native wildlife is improved and the area is cooler in summer. It reduces the need for garden watering and decreases water bills. Erosion and the downstream effects of stormwater pollution on nearby rivers, lakes or ocean are reduced.

THINGS TO CONSIDER

Water Sensitive Design is applicable on all sites but the degree of application will vary according to the site's opportunities and constraints. All sites should be able to maximise permeable surfaces such as garden beds, lawns, porous paving and paths.

When seeking to install sub surface units such as soakwells and infiltration trenches the following things should be considered.

Site

Soil Type - check the soil type. Sandy soils are excellent for infiltration but clay soils tend to become waterlogged. This will affect the efficiency of some of the water sensitive design solutions. For example, water sensitive design in heavy clay soils may need to be supplemented with traditional conveyancing methods.

Soil Depth - ensure that you have sufficient soil depth. Areas with shallow soil underlain by impervious rock such as granite, shale or limestone may impede infiltration and may require some stormwater pipes to remove water for discharge off site.

Groundwater - determine the depth to groundwater. A high groundwater table may reduce the effectiveness of infiltration methods during storms.

Slope - ensure that the stormwater design accounts for the terrain as severe slopes increase run-off velocities.

Regulations - check with Council before employing water sensitive design solutions. Some components of WSUD may conflict with local government drainage regulations.

OTHER DESIGN SUGGESTIONS

Ensure there are no illegal cross connections of sewer and stormwater drains.

Prevent rain from washing sediment (e.g. sand, soil) into stormwater with a roof, tarpaulin or awning.

Divert stormwater from driveways, paths and other impervious surfaces to vegetated areas to catch, filter and infiltrate water rather than directing water to the stormwater system.

Measures to promote water conservation

> Appropriate landscaping [See: Outdoor Water Use; Sustainable Landscape]

> Water harvesting [See: Rainwater]

> Stormwater and greywater recycling. [See: Wastewater Re-use]

Environmental Benefits

Downstream environmental benefits of reduced stormwater pollution (from the NSW EPA)

> Rivers, lakes and beaches will be cleaner and safer for swimming.

> Flooding will be reduced.

> Waterways will look cleaner.

> Councils will need to spend less money emptying stormwater traps.

> The environment will be healthier for plants and animals.

Mirvac Lendlease Village Consortium

CASE STUDIES

Newington, the Olympic Athlete's village, is a newly built suburb in Sydney near Homebush. Wastewater and stormwater are collected, treated and supplied to all houses and open spaces by dual reticulation for outdoor use.

Michael Mobbs' house is a single terrace house in Sydney that reuses water from the toilet, laundry and outdoors. It is an ambitious, living experiment in self-sufficiency.

Kogarah town centre is a multi building high-density development in Sydney. It employs indoor water efficiency and rainwater harvesting for toilet and outdoor use. It includes a water feature allowing connection between people and the site's natural water cycle. Construction began in 2001.

Mawson Lakes is a 'new town' in outer Adelaide, with residential, industrial and commercial districts. Wastewater and stormwater will be collected, treated and supplied to all houses, industries and open spaces by dual reticulation for outdoor water use and toilet flushing. Optimising the use of recycled water is achieved by using aquifer storage and retrieval. This will allow recycled water to be produced in winter for storage and used in summer. Recycled water is also used for the lake that is central to the development.

UNSW Ecoliving House is a single house in Sydney that achieves greywater and rainwater reuse. It is functioning and continues to be improved.

Christie Walk (below) is an inner-city medium-density housing development in Adelaide that harvests all stormwater from the site and stores it in underground tanks below the car parking areas. The captured water is used for irrigation of site vegetation, including balconies and a roof garden, and for toilet flushing to reduce the import of mains water. [See: Medium Density - Adelaide]

ADDITIONAL KEY REFERENCES
See fact sheets on: Rainwater, Wastewater Reuse, Outdoor Water Use; this document.
Mobbs, M. (1998) *Sustainable house: living for our future*. Sydney, Choice Magazine.
King County Stormwater Pollution Control Manual www.dnr.metrokc.gov/wlr/dss/spcm.htm
Qld DNR (1999) Stormwater Recycling Background Study (Report 4)
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