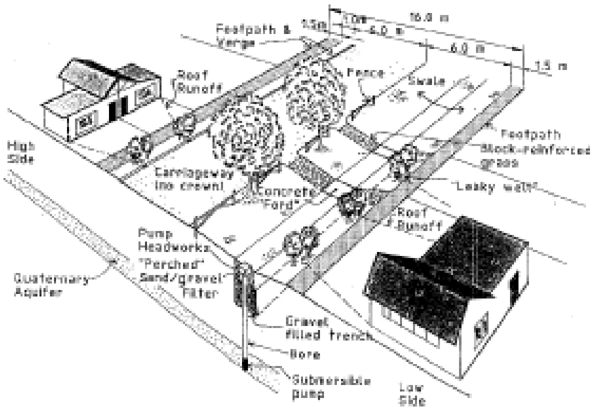
The WaterSmart Home



WaterSmart homes are part of the contemporary trend towards more 'sustainable' solutions that protect the environment and cost less. The WaterSmart Practice Notes series has been prepared to help keep builders, designers, renovators, homeowners and others abreast of this rapidly developing field.

Each practice note provides an overview of the subject, reviews the main design, installation and maintenance issues, gives details of products and suppliers and includes diagrams, references and useful websites. This Practice Note introduces the whole series.

- **What is a WaterSmart home?**
- **Why WaterSmart?**
- **What are the options?**

The WaterSmart Home

What is a WaterSmart home?

A ‘WaterSmart’ home is one in which the dwelling and its surrounding land are designed and used so as to minimise harmful impacts on the natural water cycle. It responds to natural site features, takes advantage of nature’s own water supply (rain), uses water efficiently and helps maintain the quality of water in our rivers and streams. It can also save money!

Why WaterSmart?

WaterSmart homes help to counteract many of the negative impacts of urban development on the natural water cycle, such as increased flooding, accelerated sedimentation, poor water quality in urban watercourses, degraded aquatic systems and the high cost of providing urban water infrastructure. Often these problems have been compounded by traditional stormwater drainage practices.

By incorporating WaterSmart measures in the design of new homes and the renovation of existing homes, it is possible to help:

- reduce flood risk in urban areas
- prevent erosion of waterways, slopes and banks
- improve water quality in streams and groundwater
- make more efficient use of water resources
- reduce the cost of providing and maintaining water infrastructure
- protect and restore aquatic and riparian ecosystems and habitats
- protect the scenic, landscape and recreational values of streams.

Differences from traditional practice

Traditional water supply, stormwater and wastewater practices have been largely based on centralised collection, conveyance and treatment of water flows. Whilst highly effective, these methods can also have major drawbacks, such as inefficient use of water resources, environmental degradation and rising infrastructure costs.

By contrast, WaterSmart development provides a more decentralised approach that is more attuned to natural environmental processes. It emphases on-site collection, treatment and utilisation of water flows as part of an integrated ‘treatment chain’. Elements in the chain may include:

- reuse of roof water for hot water systems, toilet flushing or irrigation
- reuse of runoff or wastewater for irrigation
- infiltration of stormwater to underground aquifers
- specially designed and maintained landscaping for cleansing runoff and conserving water.

The WaterSmart home requires sensitive responses by designers to each individual site. This means that careful consideration must be given to site characteristics such as soil type, slope, water table, rainfall, and the scale and density of development.

New homes

There is enormous scope for designing new homes from scratch so that that they incorporate a variety of WaterSmart measures, including rainwater tanks, porous paving, infiltration devices and landscape measures.

If designed as part of an overall site strategy, a water sensitive home can be cheaper than a conventional one, particularly when long-term water costs are considered. Ask your architect or designer to carefully consider the options.

Existing homes

Converting or 'retrofitting' an existing home presents considerably more constraints than designing a new home. Water supply and drainage systems, paved areas and landscaping are already established, and may have many years of useful life left.

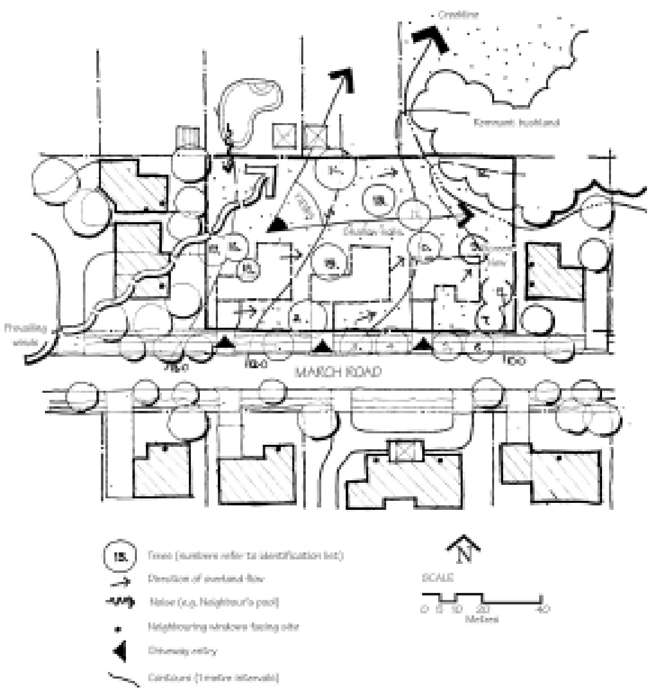
However, any renovation work that involves replacement or renewal of these assets should carefully consider the options for installing 'water sensitive' measures such as rainwater tanks, porous paving, infiltration devices and landscape measures. Studies show that there can be significant long-term cost savings.

This allows existing problems to be dealt with and helps ensure that the final design is in tune with the site's topography, climate, soils, vegetation and water.

Practice Note 2 explains how to prepare an integrated site plan that responds positively to site constraints and opportunities. It gives a general guide to the wide range of factors that influence the design, layout, construction and on-going use and maintenance of a development site. Of particular interest are five simple design rules for reducing impacts on the site and the water cycle. Also covered are common mistakes and practical tips on how to avoid them.

Site planning

The first rule is *understand the site*! Before deciding where to place buildings, driveways and other structures, the wise designer identifies the opportunities and constraints of the site and integrates them into a 'whole site' approach.



Example of a site analysis plan

Drainage design

Stormwater management is a fundamental consideration in the planning and design of urban development. Unfortunately, it is often treated as a subsidiary issue that is not addressed until the final stages of the planning and design process. By considering stormwater and drainage issues at the initial design phase it is possible to ensure viable stormwater management solutions that are compatible with other design objectives for the site.

Conventional drainage practices aim to collect and convey stormwater to the street drainage system with a minimum of nuisance, danger or damage. However, this causes rapid and concentrated stormwater discharges that contribute to increased flooding, erosion and sedimentation, and reduced stormwater quality. These problems can be mitigated by alternative measures that delay stormwater discharges and reduce the total volume of stormwater discharged.

Practice Note 3 gives a general introduction to drainage design and the benefits of using alternative stormwater management measures.

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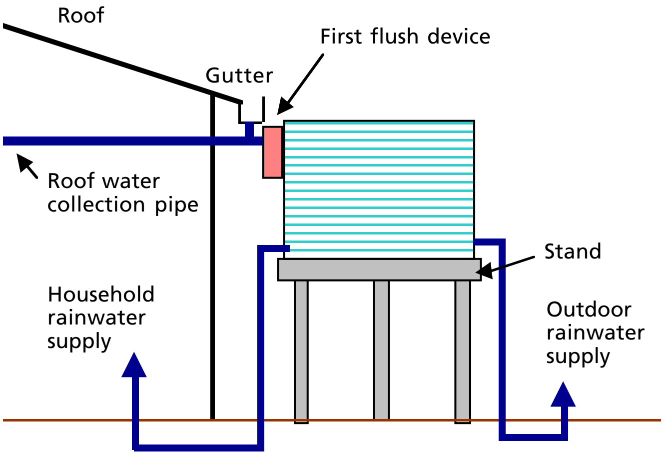
Rainwater tanks

There is currently an enormous resurgence of interest in using rainwater tanks due to their many economic and environmental benefits. Rainwater collected from roofs and stored in tanks is a excellent water source for hot water systems, toilets, washing machines and garden irrigation. Tanks can be designed not only as a water source, but also to provide temporary stormwater detention.

Tank design generally needs to consider local climatic conditions. However, in urban areas, dual systems that are interconnected with the reticulated water supply are a very practical option that provide an assured supply. Extensive studies have shown that acceptable water quality can be maintained in domestic rainwater tanks.

Benefits of rainwater tanks include reduced mains water demand, reduced water supply infrastructure costs, improved environmental flows downstream of water supply dams, and reduced concentration of stormflows in urban streams.

Practice Note 4 describes how to design and configure various types of domestic rainwater tank systems, including gravity systems, pressure systems and dual supply systems.

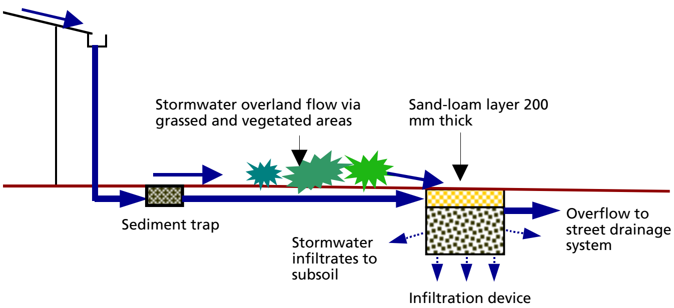


Configuration for a gravity rainwater tank system

Infiltration devices

Infiltration devices allow percolation of stormwater to the surrounding soil, whilst also providing temporary storage of storm runoff. This can have many benefits, including reduced concentration of stormflows, less reliance on piped drainage and increased groundwater recharge.

Modern infiltration devices are designed and constructed so as to minimise clogging by silt material, and can be designed to overflow to landscaped areas or the street drainage system when their storage capacity is exceeded during major storms. A number of pollutant removal mechanisms operate within these devices, giving significant water quality benefits.



A typical infiltration strategy

Design and placement of infiltration devices needs to consider site conditions such as slope, soil permeability and reactivity to water, and proximity to buildings. Extensive research has shown that infiltration is a very practical option for managing stormwater provided that these factors are correctly taken into account.

Practice Notes 5 explains how to design and configure stormwater infiltration devices, including leaky wells, retention trenches and infiltration basins.

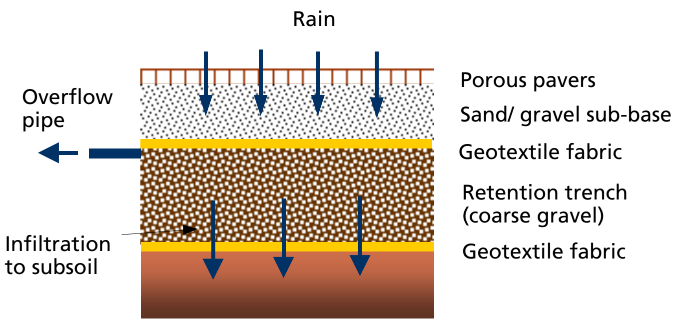
Paving

In urban areas, paved (or 'impervious') surfaces such as roads, driveways and courtyards cover a very significant area. These surfaces have many harmful impacts on the water cycle. They contribute to increased peak and total stormwater discharges, increased downstream flooding, streambank erosion, sewer surcharges, and the need for expensive infrastructure to mitigate nuisance flooding. Paved areas also reduce the volume of rainwater that infiltrates to the subsoil

The impacts of paved surfaces can be reduced by:

- limiting the area of paved surfaces
- directing stormwater runoff from paved surfaces to landscaped areas, gardens and lawns rather than to the street drainage system
- using porous paving systems.

Porous paving allows stormwater to percolate through a hard surface to a sub-base. This acts to filter stormwater before it infiltrates to the soil.



Grid & modular porous paving system

Benefits include reduced peak stormwater discharges, increased groundwater recharge, improved stormwater quality and multiple-use of paved areas. Design and placement of porous paving needs to consider site conditions such as slope, soil conditions and traffic volumes. A number of porous paving products are commercially available.

Practice Notes 5 describes a range of paving options that can manage and treat stormwater.

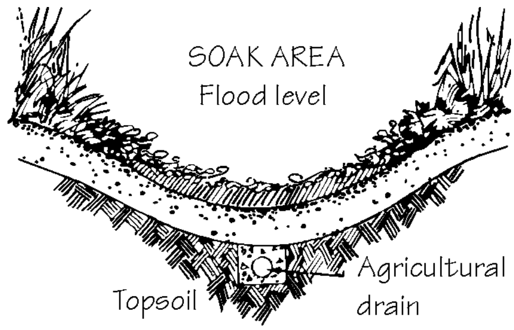
Landscape measures

A wide variety of landscape measures can be used to manage stormwater flows, utilise stormwater within the site, and minimise supplementary watering of landscaping. The careful design and placement of landscape measures can have many benefits for the water cycle, including reduced peak stormwater discharges, increased groundwater recharge, reduced erosion and sedimentation, increased retention of soil moisture and lower water costs. This is in addition to likely aesthetic and ecological benefits.

Practice Note 7 describes a variety of landscape measures, including:

- rock or gravel basins
- vegetated filter strips
- contour banks
- soak or bog areas
- wind and sun protection
- plant selection
- minimising lawn
- efficient irrigation.

For optimal results, these measures need to be undertaken in conjunction with careful site planning and drainage design, as well as appropriate landscape practices.



Soak areas can be designed for natural low points

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Landscape practices

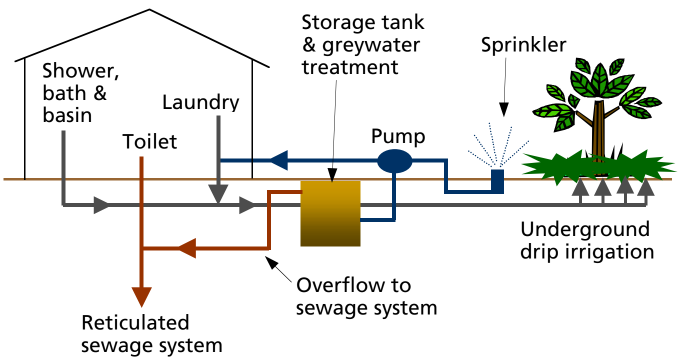
The way in which landscape practices are undertaken can also make a significant contribution to managing soil and water within the site. Relevant issues include soil preparation, planting, ongoing plant care, mulching and maintenance regimes

Practice Note 8 explains how to undertake landscape practices that promote efficient water use as well as good plant growth.

Wastewater reuse

The majority of water used for indoor domestic purposes is discharged after use as ‘wastewater’. Wastewater can be collected by a reticulated sewage system and treated at a conventional wastewater treatment plant. Alternatively, it can be collected, treated and re-used on-site, thereby promoting more efficient water use. This has many significant economic and environmental benefits for the community. However, on-site reuse of domestic wastewater is subject to various restrictions due to concerns about effluent quality, maintenance and health issues.

Practice Note 9 gives a general introduction to the options available for on-site waste water treatment and re-use.

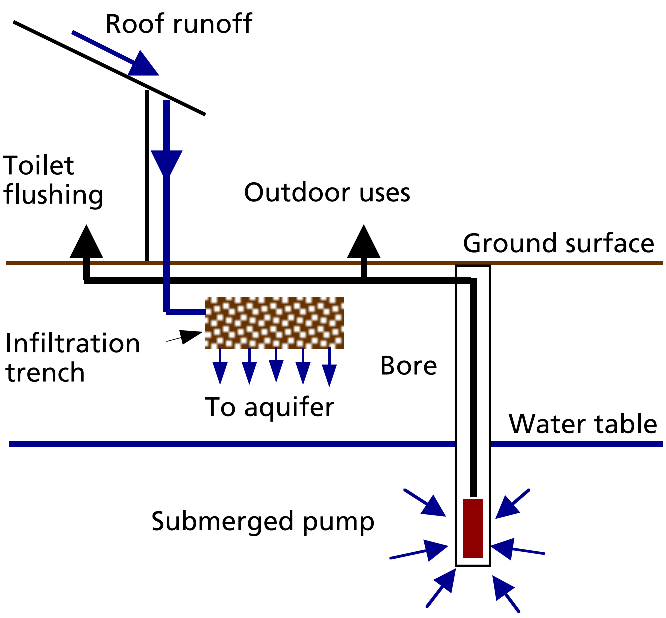


A secondary greywater reuse system

Groundwater

Groundwater extracted from bores can be an important water source for domestic use. Many urban areas occur over a suitable aquifer. Indeed, the use of groundwater in Australia for outdoor purposes is commonplace.

Groundwater quality varies from place to place, and may be unsuitable for domestic purposes. For example, groundwater can be saline or be contaminated by human activity. Where groundwater quality is unsuitable, artificial recharge of stormwater into the aquifer can often be used to produce suitable water supplies. This process is known as aquifer storage and recovery.



Conceptual aquifer storage & recovery scheme

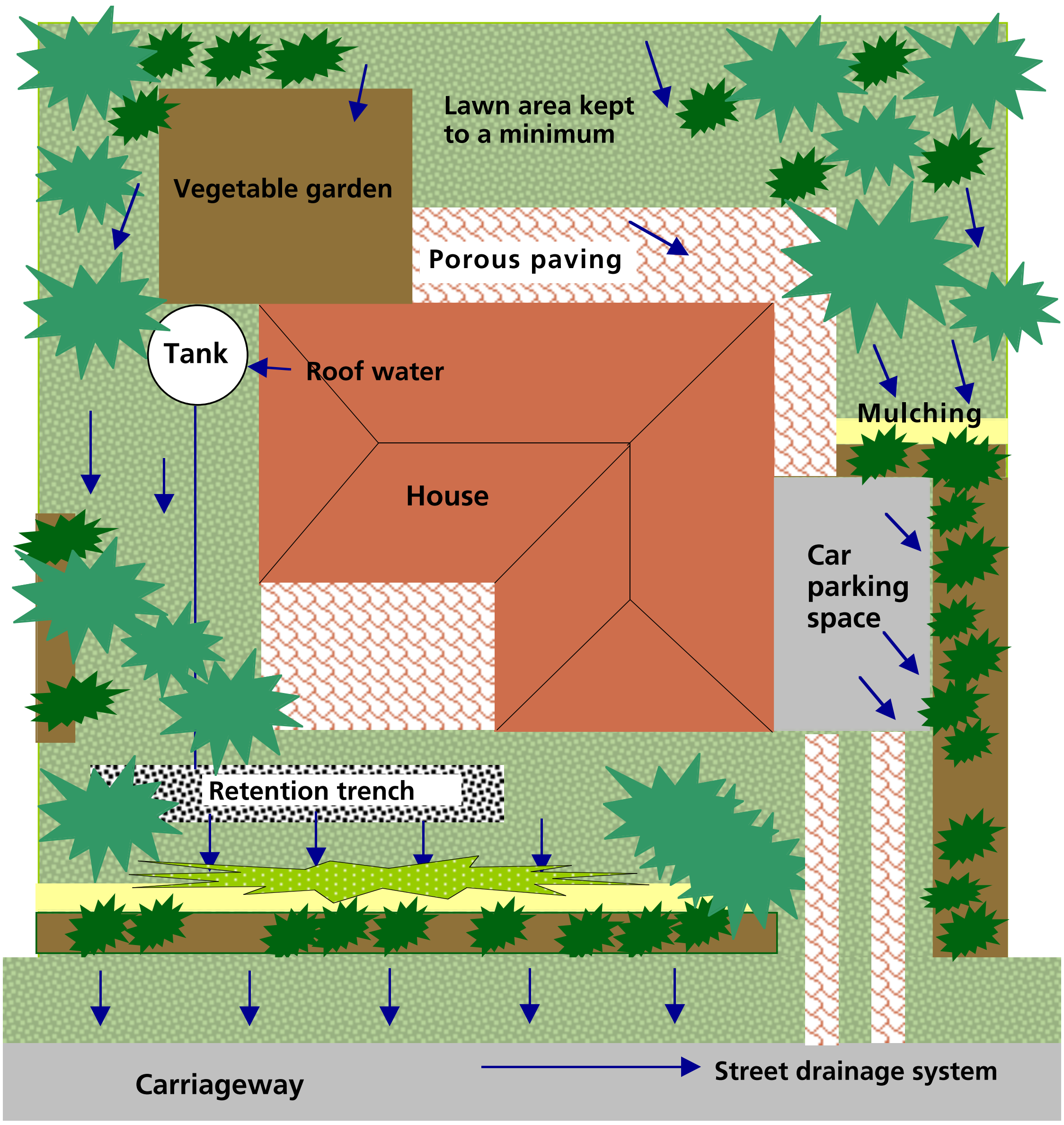
As well as positive benefits, groundwater utilisation schemes have the potential to cause adverse impacts on local groundwater levels and quality. Consequently, specialist advice is required from qualified personnel. In addition, approvals from relevant authorities are also required.

Practice Note 10 gives a general introduction to groundwater utilisation measures.

Preparing an overall strategy

A combination of rainwater tanks, porous paving, infiltration devices and landscape measures can be very efficient at reducing stormwater discharge, improving stormwater quality and reducing mains water demand. For maximum effectiveness, these measures need to be carefully designed as part of an overall strategy that considers local site conditions.

The figure below shows a possible overall strategy for a typical suburban home. A rainwater tank supplies rainwater for toilet flushing, hot water, and for outdoor use. During prolonged or heavy rain, water overflows from the rainwater tank to a retention trench. Stormwater runoff from paths, driveways and lawns is directed to garden areas. Excess runoff from impervious surfaces is directed to the retention trench, or overflows to the street drainage system.



Example of an overall stormwater strategy for a typical suburban dwelling

Other practice notes

The other WaterSmart Practice Notes in this series provide more detail on each of the topics referred to above. Their titles are:

No. 2	Site Planning
No. 3	Drainage Design
No. 4	Rainwater Tanks
No. 5	Infiltration Devices
No. 6	Paving
No. 7	Landscape Measures
No. 8	Landscape Practices
No. 9	Wastewater Reuse
No.10	Groundwater
No.11	Site discharge index

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Principal Authors: Peter Coombes and Rosanne Paskin. Design and Layout by Planning Plus.

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