Water Sensitive Urban Design

Compliance guidelines for new development

When it rains...
How to deliver effective stormwater management

Water sensitive
Urban design elements

Why create WSUD?
Environmental and social opportunities

Case Studies
4 case studies for reference

Bayside
CITY COUNCIL

Compliance guidelines for new development

The purpose of this guideline is to assist planning permit applicants to understand Local Planning Policy – Clause 22.10: Water Sensitive Urban Design (Stormwater Management) in the Bayside Planning Scheme, and to provide advice on the implications of the policy when submitting a planning permit application.

This guideline is not intended to be detailed instructions for the design and construction of water sensitive urban design elements, but rather an outline of the range of elements that can be used to achieve the objectives of the policy and where to get further design assistance and advice.

Contents

Changes in urbanisation have created a dramatic increase in the area of impervious surfaces.

Stormwater quality improvements can be achieved using different WSUD elements.

1//

What is Clause 22.10 – Water Sensitive Urban Design (Stormwater Management) Policy?

Clause 22.10 – Water Sensitive Urban Design (Stormwater Management) Policy is a new Local Planning Policy in the Bayside Planning Scheme.

The objectives of the policy are:

- to promote the use of water sensitive urban design, including stormwater re-use.
- to protect the surface water and ground waters in the Port Phillip Bay catchment from stormwater pollutants.
- to reduce the effects of peak stormwater flows.
- to integrate stormwater treatment measures into the landscape.
- to reduce the entry of pollutants into stormwater run-off.

The policy requires that:

- post-construction stormwater run-off should be treated to remove 80% suspended solids, 45% total phosphorous, and 45% total nitrogen of typical urban annual load and maintain discharges for the 1.5 year ARI (Average Recurrence Interval) at pre-development levels. This is the best practice performance objective set out in *Urban Stormwater: Best Practice Environmental Management Guidelines, CSIRO 1999*.
- best-practice measures such as those contained in U*rban Stormwater: Best Practice Environmental Management Guidelines* be incorporated into the design of a development.
- stormwater quality treatment measures be designed to prevent litter being carried to receiving waters. This includes appropriate design of waste enclosures and use of gross pollutant traps for developments with potential to generate significant amounts of litter.

The policy provides direction and guidance to Bayside City Council as the responsible authority in decision-making on the management of stormwater as part of new development. It also assists the community to understand how Council will consider planning permit applications.

2//

How does the policy apply to me?

The policy applies to all planning permit applications for:

- Accommodation (including one or more dwellings where a planning permit is required, residential building, residential village, retirement village, dependent person's unit, group accommodation. See 'accommodation' in the Bayside Planning Scheme for other uses included within its definition.)
- Construction of a building to be used for commercial, industrial, or mixed-use purposes.
- Subdivision in a business zone.

The policy does not apply to an application for:

- Extension or alteration of an existing building of less than 50 square metres in floor area.
- Subdivision of an existing building.

The policy does not apply to residential subdivisions. Residential subdivisions are covered by clause 56 of the Victorian Planning Provisions.

3//

What is water sensitive urban design?

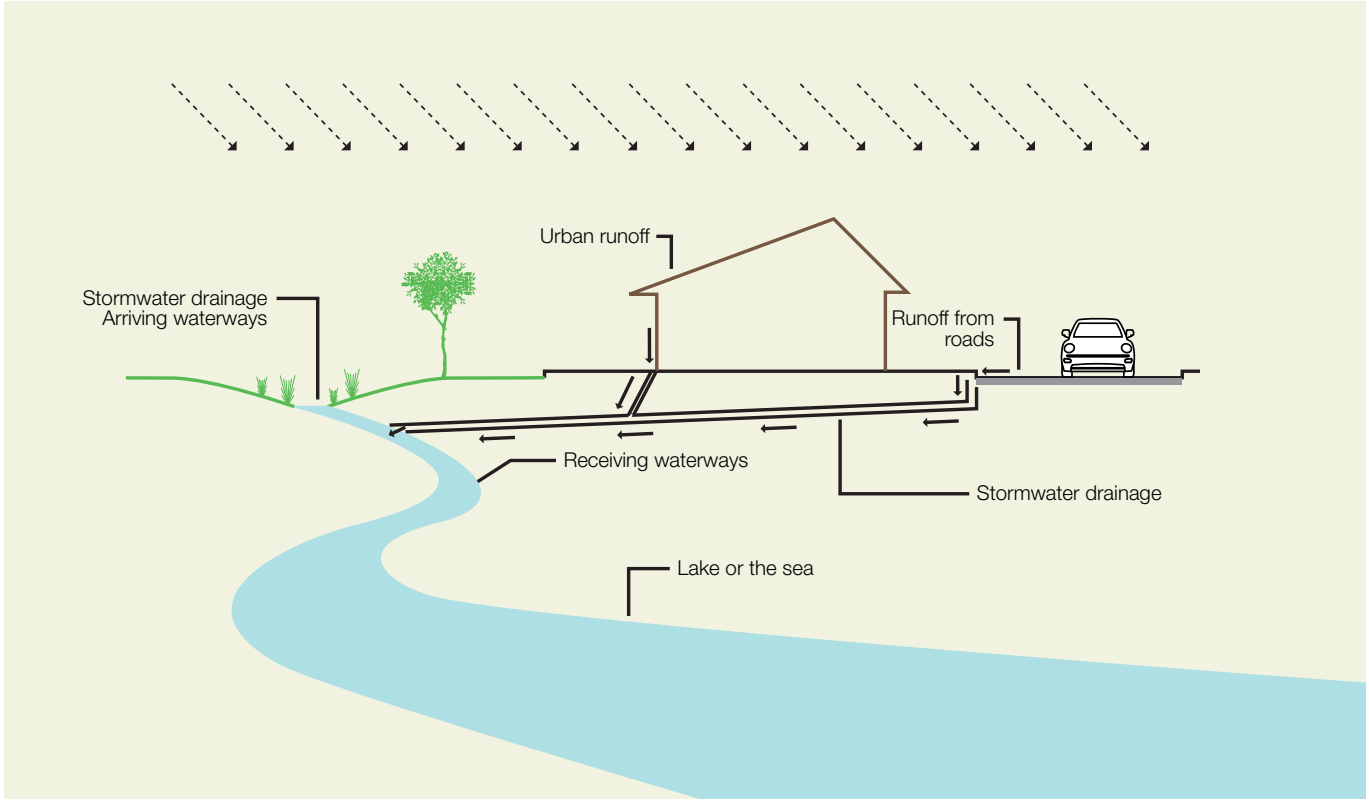
Water sensitive urban design (WSUD) is the integration of urban design, site layout/design and building design, with constructed elements that can provide on-site stormwater quality treatment and may enable its re-use.

WSUD offers an alternative to the traditional conveyance approach to stormwater management where water is directed via pipes and waterways, ultimately to the bay.

WSUD emphasises the benefits of stormwater as a resource and waterways as an environmental asset, rather than the conventional view of stormwater being a nuisance which should be disposed of as quickly and easily as possible to the detriment of receiving waterways.

Through an integrated approach WSUD seeks to minimise the extent of impervious surfaces and mitigate changes to natural water balance through on-site re-use of water as well as through temporary storage and treatment.

Managing urban run-off in a water sensitive manner not only addresses the problems associated with stormwater, it also improves the social and environmental amenity of the urban landscape and helps to reduce the capital and maintenance costs of drainage infrastructure.



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Why do we need water sensitive urban design?

Changes in urbanisation, particularly population growth and increasing urban density, have created a dramatic increase in the area of impervious surfaces within the Port Phillip Bay catchment.

The high proportion of sealed area greatly affects both the quality and quantity of water infiltrating the soil and, as most of this rainfall is converted into run-off that is directed into our urban waterways, ultimately Port Phillip Bay.

Run-off carries a range of pollutants into waterways and, although concentrations may be diluted during a run-off event, the total loads can affect the environmental quality of downstream aquatic habitats. The types of pollutants that can be found in stormwater run-off are sediments, nutrients, oxygen-demanding substances, pH (acidity), micro-organisms, toxic organics, heavy metals, litter, soil and surfactants, and increased water temperature. It is recognised that a large component of this is contributed by run-off from roads, however, the traditional forms of stormwater management allow the unimpeded transport of pollutants from private developments into waterways.

The guiding philosophy of water sensitive urban design is centred on achieving sustainable urban water management solutions for urban developments.

To achieve ecologically sustainable development, the treatment of stormwater run-off can no longer be considered in isolation of the broader planning and design of the contributing urban area. Protecting the beneficial uses of urban waterways and the bay requires an integrated approach directed at managing the volume and rate of catchment run-off, the quality of the run-off, and the habitats necessary for supporting aquatic life.

Flood prevention and public safety remain fundamental objectives of stormwater planning and design, and stormwater-quality measures should in no way compromise these objectives.

Water sensitive urban design will improve the quality of stormwater ultimately entering Port Phillip Bay.

5//

What are the benefits of water sensitive urban design?

Water sensitive urban design emphasises the benefits of stormwater and waterways as resources and assets, rather than the conventional view of stormwater as a nuisance. Managing urban run-off in a water sensitive manner not only provides many opportunities to integrate water features into urban design, but improves the social and environmental amenity of urban development.

Some of these opportunities are:

Environmental and social opportunities

- Hydrological balance: maintains the hydrological balance by using natural processes of storage, infiltration and evaporation.
- Sensitive-area protection: protects environmentally sensitive areas from urban development.
- Waterway restoration: restores and enhances urban waterways.
- Potable water substitution for fit-for-purpose use: reduces demand on potable water supply.
- Impact reduction: minimises the impact of urban development on the environment.
- Natural habitat enhancements: can increase the diversity of natural habitats and suburban landscapes.
- Groundwater recharge: increase levels of groundwater.
- High visual amenity in urban and residential landscapes: increased reliance on the landscaping to manage stormwater will improve the visual amenity of urban areas.

Economic opportunities

- Capital cost savings: reduces capital costs associated with drainage.
- Construction cost savings: reduces construction costs associated with grading and tree clearing.
- Water-quality cost savings: potentially reduces the costs of water-quality improvement by retaining existing waterway health.
- Developer cost savings: reduces developer contributions for downstream drainage capacities.
- Improved market value: incorporating water features, water re-use opportunities, and preserving and enhancing ecological systems, tends to make developments more desirable and marketable.
- Improved resources utilisation: offers cost benefits where areas are unsuitable for residential development, but are suitable for passive recreation and contribute to required public open-space allocation.

Water sensitive urban design treats stormwater as an asset rather than a nuisance.

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What water sensitive urban design elements can I incorporate into my development?

Many water sensitive urban design elements can be incorporated into a development. The best option for you depends on the development proposed and the site characteristics. Some of these elements may not be suited to a single dwelling, but many can be adapted to meet the specific needs of each development.

Rainwater tanks

Rainwater tanks collect run-off from roof areas and can provide a supplementary source of non-potable water in urban areas.

They provide temporary storage of flows that can reduce peak flow rates and retain rainfall on-site. Tanks also provide some treatment through settlement of suspended soils.

They can be a water source for non water-quality sensitive uses like watering gardens and flushing toilets, and a relatively small tank can be used for this purpose domestically.

A rainwater tank is one of the most appropriate WSUD elements for residential developments to meet the stormwater-management requirements.

Rain gardens

A rain garden is a specially designed garden bed that takes rainwater directly from a roof or any outdoor surface that produces run-off. It has a sand base and can be planted with a range of plant species.

An overflow pipe at the top enters the main stormwater system in the event of excessive rain. An 'aggy' pipe at the bottom of the garden slowly releases water into the ground or back into the stormwater pipe.

Its main aim is to treat the quality of the water through a filtration process, it also keeps rainwater on the site longer, thus plants and soil are revitalised and peak flows are reduced.

Ponds

Ponds provide fine-particle sedimentation and ultraviolet disinfection. They can be used as storages for re-use schemes, and urban landform features for recreation and wildlife habitat. Often wetlands flow into ponds and the water body enhances the local landscape.

Ponds provide a valuable storage of water that could potentially be re-used – for example, as irrigation. Ponds and lakes can also be used as focal points in developments, with houses, streets and other developments having an aspect over the water.

6// What water sensitive urban design elements can I incorporate into my development?

Bioretention systems

Bioretention systems (or filtration trenches) can provide efficient treatment of stormwater through fine filtration, extended detention, and some biological uptake. They are particularly efficient at removing nitrogen and other soluble or fine particulate contaminants. They also provide flow retardation.

Bioretention systems require an even flow distribution to allow water to infiltrate the filter media. This increases the amount of time that run-off can infiltrate and also increases the volume of run-off that is treated.

Bioretention systems can be scaled in size to suit a wide range of applications. Even in hard-surfaced, highly developed, inner-urban areas, bioretention systems can be an effective means of treating stormwater.

On-site infiltration

On-site infiltration measures encourage stormwater to infiltrate into surrounding soils. They are highly dependant on the local soil characteristics and are best suited to sandy soils with deep groundwater. This allows adequate filtration through the soil before reaching the groundwater body.

Infiltration measures generally consist of a shallow excavated trench or tank capable of draining to the soil.

They reduce run-off as well as provide pollutant retention on site. Generally, these measures are well suited to highly permeable soils so that water can infiltrate with sufficient rate, however, areas with less permeable soils may still be applicable with larger areas for infiltration.

Infiltration trenches also provide for passive irrigation where run-off from impervious areas can be used to irrigate surrounding soils. Infiltration measures can also be vegetated and provide landscape amenity to the area and property.

These systems provide improved pollutant removal through active plant growth, improving filtration and ensuring the soil does not become clogged with fine sediments.

Sediment basins

Sediment basins are used to retain coarse sediments from run-off. They operate by reducing flow velocities and encouraging sediments to settle out of the water column.

Sediment basins are frequently used for trapping sediment in run-off during construction activities and for pre-treatment to measures such as wetlands. They can drain during periods without rainfall and then fill during run-off events.

They are sized according to the design peak-storm volume and the target particle size for trapping.

A maintenance regime is required to remove accumulated sediment.

It is unlikely that a finished and occupied individual allotment would generate sufficient sediment to warrant the inclusion of a sediment basin within the stormwater system, however, this could be incorporated into an industrial or mixed-use development as a pre-treatment to a wetland or bio-retention system.

Vegetated swales

Vegetated swales are used to convey stormwater in lieu of pipes. The system uses overland flows and mild slopes to slowly convey water downstream. The interaction with vegetation facilitates pollutant settlement and retention in the vegetation. Vegetation acts to spread and slow velocities, which in turn aids sediment retention.

Swales can be incorporated in street or driveway designs and add to the aesthetic character of an area.

To convey flood flows in excess of the design capacity, pits draining to underground pipes can be used. Water surges from the swale and down the pit.

Swales can use a variety of vegetation types that must be capable of withstanding flows and be of a sufficient density to provide good filtration.

Swales can become a feature of a landscape and, once established, require minimal maintenance.

Buffer strips

Buffer strips are intended to provide discontinuity between impervious surfaces and the drainage system.

They take water from impervious surfaces in a distributed manner, provide even flows, and filter sediments and coarse pollutants contained in the run-off. The low hydraulic loading over the vegetation allows flows to filter through the vegetation and pollutants to settle out. They also provide a detention role to slow flows down.

Buffer strips can also be a pre-treatment for other stormwater measures, such as bioretention systems, by removing coarse material that would otherwise clog the system.

Buffer strips are often grassed areas along the edge of roads, which transfer water into swales or conventional drains.

They can also be used to filter run-off from other areas, but require flows to be distributed at the entry.

Maintenance is required on buffer strips to ensure that vegetation is healthy and has good coverage over the site.

Wetlands

Constructed wetland systems use sedimentation, fine filtration, and nutrient-uptake processes to remove pollutants from stormwater. Constructed wetland systems generally consist of an inlet zone (sediment basin to remove coarse sediments), a macrophyte zone (shallow heavily vegetated area), and a high-flow bypass channel.

The wetland processes are engaged by slowly passing run-off through heavily vegetated areas and the plants filter sediments and pollutants from the water.

Additionally, the plants absorb nutrients for growth. While wetlands can play an important role in stormwater treatment, they can also have significant community benefits, provide a focus for recreation, and habitat for wildlife.

They can also improve the aesthetics of a development and be a central feature in the landscape.

Wetlands can be constructed on many scales – from house blocks to regional scales. In highly urbanised areas they can have a hard-edge form and be part of a streetscape, yet in regional settings they can be larger than 10 hectares.

6// What water sensitive urban design elements can I incorporate into my development?

Gross pollutant traps

Gross pollutant traps are intended to retain litter, debris, and in some cases sedimentation, from stormwater systems primarily through screening and rapid sedimentation, without considerably retarding flows.

They can be installed in drain entrances, underground pipe systems, at pipe outfalls, or on open channels.

As they require an operational management regime to remove the accumulated debris, these types of devices are not recommended in residential allotments.

Retarding basins

The primary function of a retarding basin is to protect downstream properties from flood damage.

Retarding basins work by having a set outlet from a basin that has smaller capacity than a large flood (generally 1-in-100-year average recurrence interval (ARI) storm). Water then banks up behind the outlet of the basin, is stored, and slowly released after the peak of the storm has passed. This regulates flows in the downstream waterway by extending the duration of flows, but capping the peak flow.

Retarding basins can require substantial areas of land for flood retardation and, generally, are not a viable option for small-scale developments.

Water sensitive urban design elements used to meet the policy's objectives should be selected on the basis of effectiveness and likelihood of integration with other aspects of site planning and local development requirements. For example, when planning private open space, water sensitive urban design elements should be of value to future occupants, providing elements that are both functional and aesthetic.

In selecting and planning the appropriate water sensitive urban design elements for your development, it is recommended that further research be undertaken on the design, effectiveness, and maintenance requirements of each element.

7

What are some examples of how water sensitive urban design elements can be incorporated into development?

The stormwater quality improvements that can be achieved using different WSUD elements for residential, commercial and industrial developments, is displayed in the following case studies.

The case studies demonstrate:

- a range of strategies for attaining high on-site performance.
- that stormwater quality improvement objectives can be achieved entirely and solely by on-site WSUD elements for all development types.

The case studies are based on those in the *Delivering Water Sensitive Urban Design: Final Report of Clean Stormwater – a planning framework*, Association of Bayside Municipalities, 2004

These case studies demonstrate that various WSUD options can be used on their own or in combination with other elements.

The preferred option for a site depends on many factors that are considered when determining a suitable strategy for the development project.

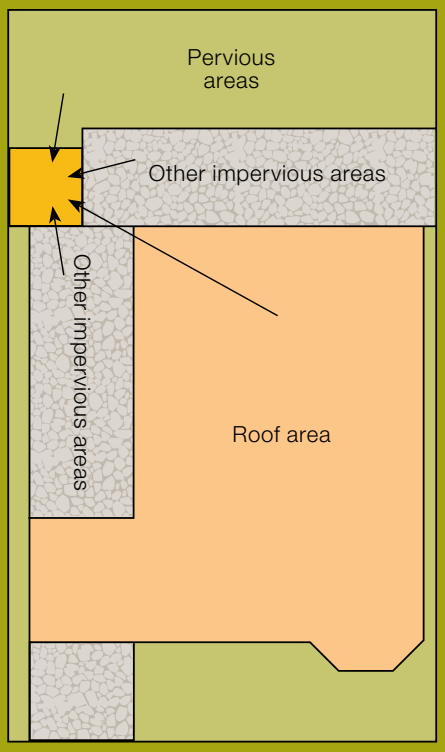
The case studies are evaluated using the free online software STORM.

There are a range of WSUD treatments that can be incorporated into developments.

traditional **family** home

Case Study No.1

Single dwelling
traditional family home



This diagram presents one possible strategy for stormwater collection and treatment at a typical family home.

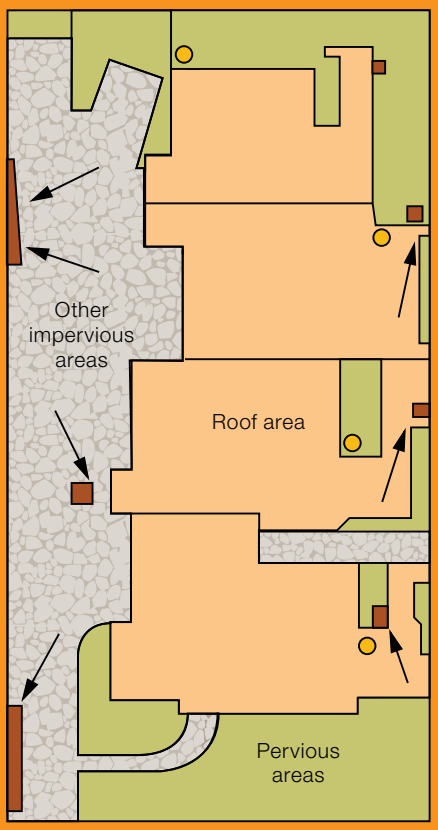
The strategy demonstrated is to direct run-off from the roof and other impervious areas to a rain garden feature. In addition to treating stormwater, the rain garden will provide a landscape feature that is an integral part of the landscape of the site.

Case study No. 1: STORM rating equation

2 per unit

Case Study
No.2

Multi-unit residential development
four dwellings



Rainwater tanks (4 at 1m³)
Bioretention (8m²)

This diagram presents a strategy for stormwater collection, treatment and re-use within a unit development.

This strategy directs each unit's roof run-off to a tank to be re-used for toilet-flushing, and direct run-off from paved areas to bioretention systems.

A site STORM rating of more than 100% can be achieved and potable water demand is reduced through re-use of rain water for toilet-flushing. The bioretention system will form part of the garden landscape.

Case study No. 2: STORM rating equation

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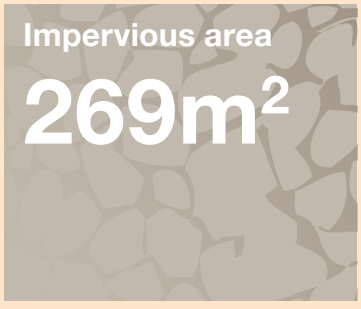

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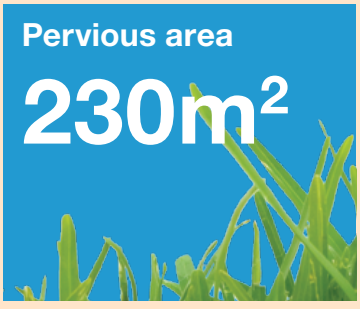

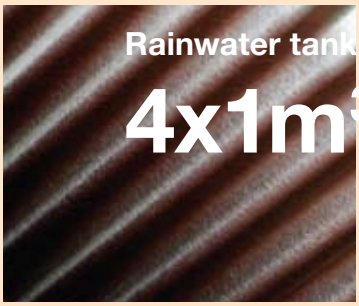

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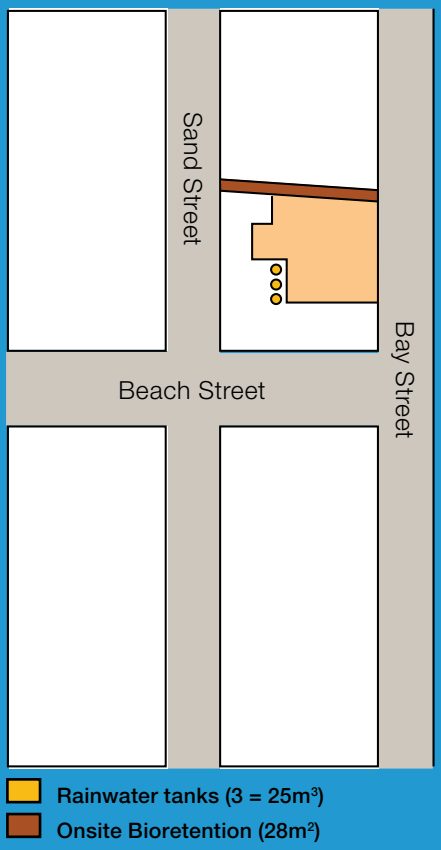
STORM rating achieved
111%

65 occupants

Case Study No.3

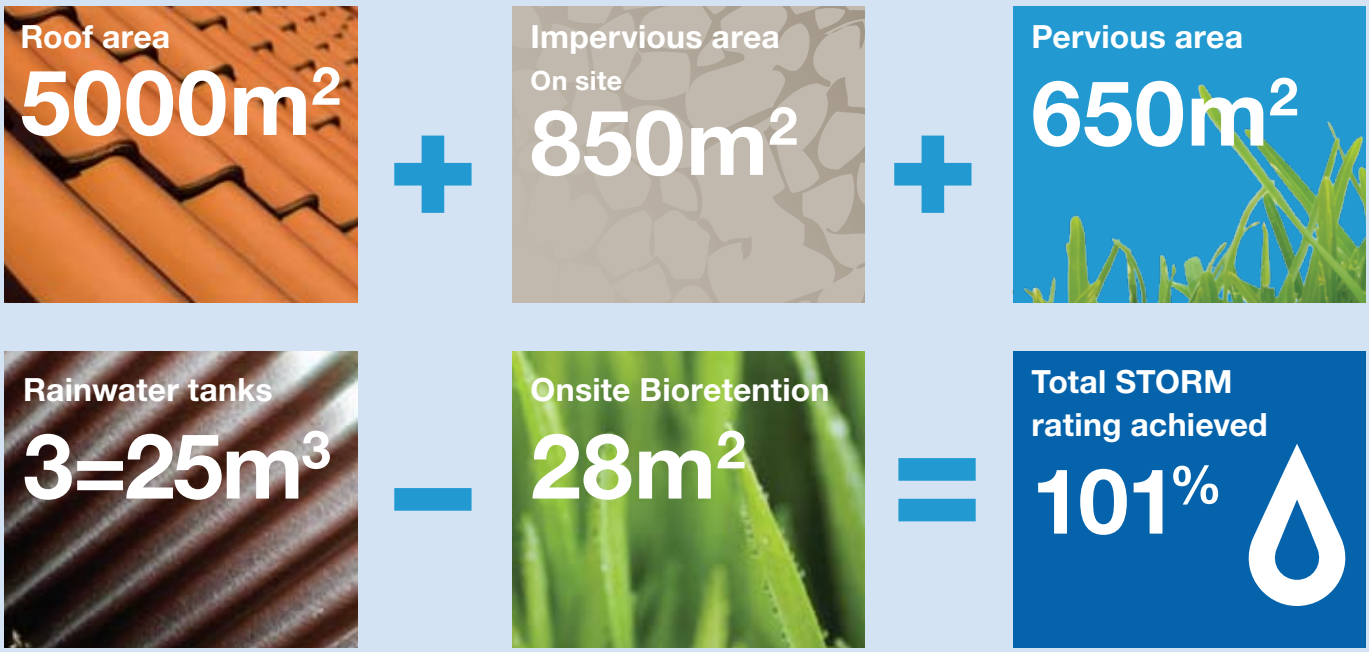
Apartment building



This diagram presents a strategy for stormwater collection, treatment and re-use at an apartment block.

To achieve a STORM rating of 100% for this development, a combination of rainwater tanks and raingardens treatment options are used. Rainwater tanks collect roof run-off for toilet-flushing re-use for some apartments. In addition, bioretention systems along the driveway collect some roof runoff and treat pavement and driveway run-off.

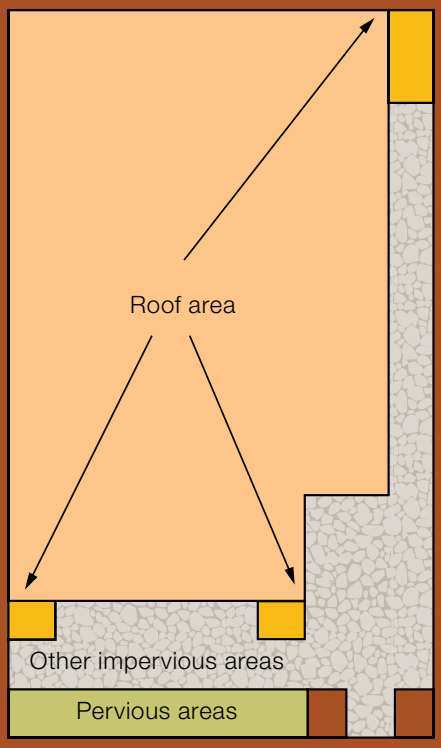
Case study No. 3: STORM rating equation



commercial/
mixed use

Case Study No.4

Warehouse



Bioretention Planter Boxes (Total 11m²)

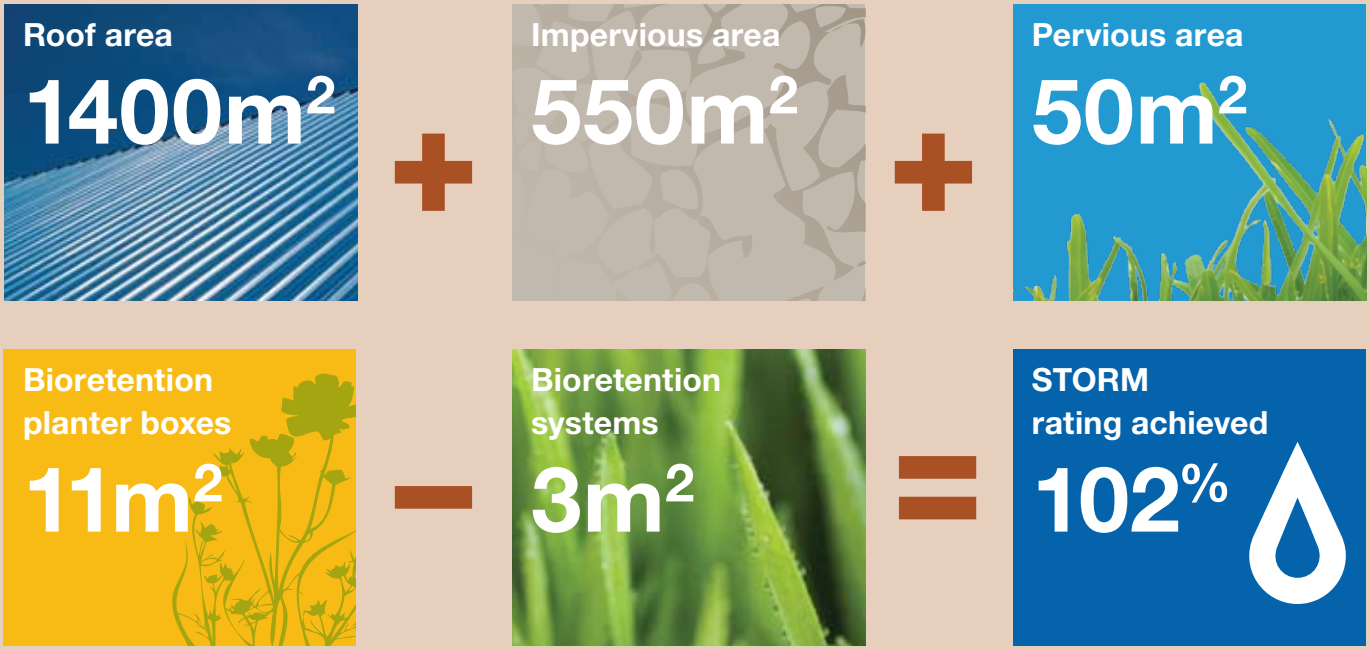
Bioretention Systems (Total 3m²)

This diagram presents a strategy for stormwater collection, treatment, and re-use at a typical warehouse/wholesale site.

This strategy directs run-off from the roof and other impervious areas to bioretention systems. Due to the limited space available, a combination of planter box and 'in-ground' bioretention systems is used. The bioretention systems form part of the garden landscape.

Planter boxes are more versatile than 'in-ground' systems as they can be retrofitted to existing development and can be used where shallow drainage outfalls exist. In this case study, it is possible to use all 'in-ground' bioretention systems.

Case study No. 4: STORM rating equation



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When is the best time to incorporate water sensitive urban design elements into my design?

Stormwater capture, quality treatment and re-use opportunities should be integrated into project design, not as an 'add-on' once project design is finalised. WSUD encourages careful site planning to protect natural systems and drainage assets, incorporating water-quality treatment with other aspects of urban design and site or building design, and re-using stormwater as a substitute water supply.

All forms of urban development – from the redevelopment of a single allotment, to a large commercial development – typically pass through three stages:

1.

Project design, including any use, design and construction approvals.

2.

Land development and building construction.

3.

Post-development occupation.

WSUD will need to be applied to deliver outcomes through each of these stages of development.

The project design phase presents a range of alternative planning and design opportunities to incorporate best-practice stormwater management.

During the construction phase the focus is on preventing the movement of sediments, building materials, waste and litter into the drainage system and ultimately the stormwater drainage system.

Once development is completed and the site occupied, sustainable stormwater management requires the appropriate management of the various stormwater elements.

Water sensitive urban design is best incorporated in the design phase.

9//

How effective will these elements be and what maintenance requirements are there?

The ongoing effectiveness of water sensitive urban design elements in delivering stormwater quality treatment will depend primarily on the attention given to the design and construction from the outset.

It is important that the element selected is appropriate in the context of the type and scale of the development. Wetland or pond systems are not elements that are appropriate for a single dwelling; and a rain tank alone will usually not be sufficient to treat the needs of an industrial development.

Additionally, it may be that no one element on its own is sufficient to address stormwater on the site and it may be necessary to accommodate a number of elements on the one site. This allows optimisation of sizing where space constraints exist.

The choice of elements will also influence ongoing effectiveness. For example, an on-site infiltration system in a private garden could be removed by a subsequent owner who is not aware of the role it plays in treating stormwater discharge. As a general rule, permanent elements should be selected for land that will remain in private ownership.

To ensure the continued functioning and maintenance of the WSUD design, depending on the type and scale of the development and the elements to be used, Council may require an environment management plan as a condition of a permit.

10//

How do I design a water sensitive urban design treatment?

Depending on the type and scale of development, it may be necessary to engage a specialist to assist in the selection and design of a WSUD treatment to suit the type of development proposed.

For simple proposals, such as a single dwelling on an allotment, it is possible for the applicant to model the effectiveness of the treatment measure using the Melbourne Water 'STORM' website <www.storm.melbournewater.com.au>, however, more complicated developments can require assistance from a design engineer.

Council can provide a list of companies that have staff qualified to assist you in the design and assessment of your proposal using industry-accepted measurement tools.

In achieving stormwater quality improvement within an allotment, one goal is to minimise the visual impact of the treatment by creating aesthetically pleasing design elements while maximising space for other activities.

This can be achieved by incorporating treatment processes into the landscaping of the site, such as designing bioretention systems to serve as planter boxes or landscaped areas, or by integrating rainwater tanks in the building design.

For a single dwelling a rainwater tank may be all that is required.

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How do I know if my development complies with the policy targets?

The policy requires that an application includes demonstrated compliance with the best-practice performance objectives set out in *Urban Stormwater: Best Practice Environmental Management Guidelines*. This can be achieved by providing a report from an industry-accepted performance-measurement tool.

There are a number of stormwater modelling systems being used including:

- STORM: available online at www.storm.melbournewater.com.au. This is most relevant to small scale developments.
- MUSIC (Model for Urban Stormwater Improvement Conceptualisation): available to buy from <www.toolkit.net.au/Tools/MUSIC>. This is most relevant to larger scale and complex developments.
- XPSTORM: <www.xpsoftware.com/products/xpstorm>

These are tools that can estimate and predict the water-quality outcomes (treatment performance) of various WSUD elements. This means that stormwater quality performance of different development proposals can be assessed and compared using a common measurement system. The capacity to measure and predict stormwater quality is an essential ingredient for designing urban development to a specified performance outcome.

While modelling tools such as MUSIC are becoming widely used to evaluate the performance of stormwater quality treatment strategies for larger scale developments, they are not commonly used for smaller developments on an allotment scale. For allotment-scale developments, STORM is a more relevant tool to use.

While specialists involved with project design will assess the development's performance using software such as MUSIC, STORM is an online assessment tool that has been simplified and can be used by people with no formal training. A treatment score of 100 or greater in the STORM tool meets the policy requirements.

This guideline does not provide instructions on how to use the various modelling systems, but provides an indication of what modelling systems are available and where to get further assistance.

Demonstrated Compliance:

45%

retention of typical annual urban load of total nitrogen.

Demonstrated Compliance:

45%

retention of typical annual urban load of total phosphorus.

Demonstrated Compliance:

80%

retention of typical annual urban load of suspended solids.

12//

What information do I need to provide with my application?

For Council to consider all applications, the following information will need to be provided:

- Three copies of a site layout plan showing the location of proposed stormwater treatment measures. This plan should show the location and size of the WSUD elements proposed in relation to buildings, sealed surfaces, landscaping areas, and any other relevant elements of the proposal.
- Demonstrated compliance, such as a report from an industry-accepted performance-measurement tool, with details of treatment performance meeting the best-practice performance objectives set out in *Urban Stormwater: Best Practice Environmental Management Guidelines*. This must show the following levels have been achieved:
  - 45% retention of typical annual urban load of total nitrogen
  - 45% retention of typical annual urban load of total phosphorus
  - 80% retention of typical annual urban load of suspended solids.
- Design details, such as cross-sections, to enable the Council to assess the technical effectiveness of the proposed stormwater-treatment measures. This should include details of proposed landscaping and plantings to be incorporated in the designs.
- A site management plan that details how the site will be managed through construction and sets out future operation and maintenance arrangements.

13//

Who can help me incorporate water sensitive urban design elements into my development?

Depending on the type and scale of the development, it may be appropriate to seek professional assistance with the design of WSUD elements as part of development.

A list of people who have undergone MUSIC and STORM training and may be able to assist in the design of your project is available from Council and also located on Council's website.

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Further information

Publications

Urban Stormwater:

Best Practice Environmental Management Guidelines, CSIRO Publishing, 1999. Available at no cost at www.publish.csiro.au/nid/197/issue/3822.htm

Delivering Water Sensitive Urban Design:

Final Report of Clean Stormwater – a planning framework, Association of Bayside Municipalities, 2004. Available on Council's website www.bayside.vic.gov.au

WSUD Engineering Procedures:

Stormwater, Melbourne Water, 2005. Australian Runoff Quality – A guide to Water Sensitive Urban Design, Engineers Australia, 2006.

Various technical reports, Cooperative Research Centre for Catchment Hydrology.

Acknowledgements

This guideline is based on Urban Stormwater:

Best Practice Environmental Management Guidelines, CSIRO, 1999, and Delivering Water Sensitive Urban Design: Final Report of Clean Stormwater – a planning framework, Association of Bayside Municipalities, 2004.

Photographs in this guideline were provided by Melbourne Water and sourced from Delivering Water Sensitive Urban Design: Final Report of Clean Stormwater – a planning framework, Association of Bayside Municipalities, 2004.

This guideline has been developed with the assistance of Melbourne Water and the Department of Sustainability and Environment /Office of Water.

Websites

Bayside City Council
www.bayside.vic.gov.au

Clearwater Information Exchange
www.clearwater.asn.au

Cooperative Research Centre for Catchment Hydrology
www.catchment.crc.org.au

Melbourne Water
www.melbournewater.com

Victorian State Government
www.environment.vic.gov.au

Victorian Environment Protection Authority
www.epa.vic.gov.au

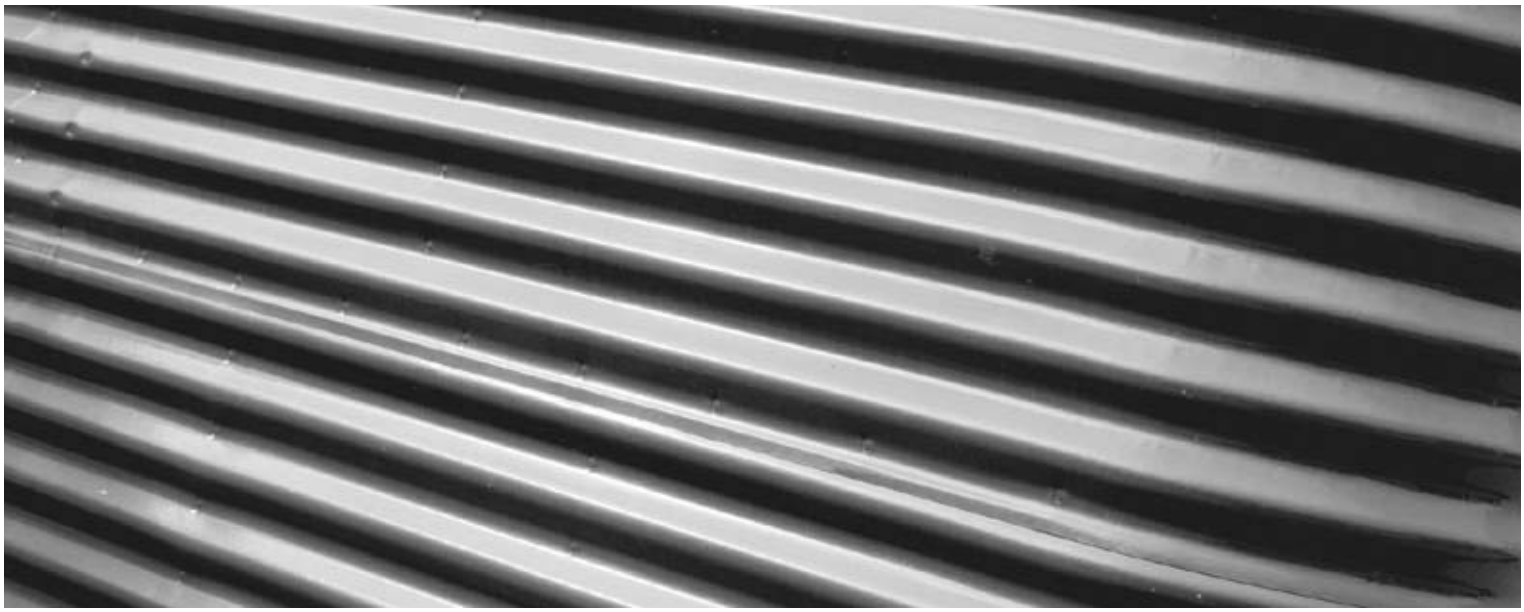
New South Wales Environment Protection Authority
www.epa.nsw.gov.au

Stormwater Industry Association (National)
www.stormwater.asn.au

Stormwater Industry Association of Victoria
www.stormwater.asn.au/vic
www.siavictoria.info

STORM online
www.storm.melbournewater.com.au

Music
www.toolkit.net.au/tools/music



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