

Rain Garden 500

Application guide

Updated April 2017

Rain Garden 500 is a Catchment to Coast project from which local governments, community groups, schools, sports clubs, churches and groups of motivated individuals can apply for funding to build a rain garden in the Adelaide Region. This guide provides information about how you can apply for this funding for the development of bio-filtration rain gardens. Rain gardens help improve the quality of stormwater from our urban environments before it travels to our local creeks and the sea. Improving stormwater quality is part of a strategy to improve seagrass health, benefit our marine environment and keep our beach water cleaner.



Established bio-filtration rain garden beds at Linde Reserve, Stepney



Rain garden bio-filtration system, prior to planting, City Of West Torrens



Tree pit bio-filtration system, Beechway Ave, Brooklyn Park

Acknowledgements: We are grateful for the valuable input provided by individuals from the following groups to develop this guide: City of Adelaide, City of Charles Sturt, City of Onkaparinga, City of Unley, City of West Torrens, Coast Protection Board, Department of Environment, Water and Natural Resources, Department for Planning, Transport and Infrastructure, Natural Resources Adelaide and Mount Lofty Ranges, SA Water, Stormwater Management Authority, University of South Australia and Water Sensitive SA.

Rain Garden 500 is a Catchment to Coast project supported by the [South Australian Environment Protection Authority](#) through funding from the [Australian Government National Landcare Programme](#).

Contents

PART 1 – Introduction	1
What is Rain Garden 500?	1
What is a rain garden?.....	1
Why is improving stormwater quality important and what are the benefits?.....	1
PART 2 – Eligibility criteria	3
What is eligible?.....	3
What is not eligible?.....	4
PART 3 – Technical information.....	6
Reference documents.....	6
Technical considerations	6
PART 4 – Budgets and project monitoring and reporting.....	15
Budget	15
Progress and final reports.....	15
Financial statements.....	16
PART 5 – Community and stakeholder engagement	17
PART 6 – Completing your application	18
Bibliography.....	19
Glossary	20
Appendix A – Design checklist	21

Tables

Table 1	Statewide WSUD performance principles and targets	7
Table 2	Plant species proven to be effective at nitrogen removal	10
Table 3	Plants that may be suitable for rain gardens, but not proven effective at nitrogen removal.....	11

Figures

Figure 1	Eligible project area	5
Figure 2	Main components of bio-retention systems	6
Figure 3	Catchment characteristics: busy roads, industrial areas, quiet suburban streets and types of leaf litter	8

PART 1 – Introduction

What is Rain Garden 500?

Rain Garden 500 is part of a South Australian Environment Protection Authority (EPA) Catchment to Coast project, funded through the Australian Government National Landcare Programme. It is a three-year grant program where local governments, community groups, schools, sports clubs and groups of motivated individuals can apply for funding to build a rain garden in the Adelaide region. The purpose of the rain gardens will be to improve the quality of stormwater from our streets and other hard surfaces, such as car parks, before it travels to our local creeks and the sea.

The improved stormwater from the rain garden may be collected and used for irrigation or returned to the stormwater system. Collectively, rain gardens and other stormwater quality improvement features, such as wetlands, installed in catchments will contribute towards less stormwater overall going out to sea and improved water quality in urban waterways and Adelaide's coastal waters. This will reduce pollution and contribute to improving seagrass health, which will benefit our marine environment and keep our beach water cleaner.

An important component of the project is to build an understanding in the community of how activities we carry out on land impact on water quality in urban waterways, creeks and coastal waters. A focus of Rain Garden 500 promotion will be the importance of improving stormwater quality and where and how rain garden installations may be incorporated. It will allow local communities to contribute to improved stormwater quality and, ultimately, seagrass health. We can all take action at our local street and community levels to improve water quality.

What is a rain garden?

A rain garden is a constructed garden designed to capture stormwater from roads, car parks, driveways, roofs and other hard surfaces, and is designed in such a way to improve the water quality of stormwater. Beneath the surface of the rain garden is a special porous soil layer (filter media) overlaying a drainage layer. The stormwater is detained in the rain garden through the design and vegetation, slowly filtering through the soil layer to the drainage at the base.

Stormwater flows are diverted and pollutants are removed through the processes of settlement (sedimentation), binding with components in the filter media and by the action of specially selected plants and associated microbial communities. Bio-filtration systems can be scaled to various catchment sizes, from a single small garden or part of a larger project, to manage stormwater. The treated stormwater from a rain garden may be collected and used for irrigation or returned to the stormwater system.

Why is improving stormwater quality important and what are the benefits?

In the Adelaide region, stormwater is collected from hard surfaces, kerbs and gutters in the stormwater network and discharged to our urban creeks and, ultimately, into coastal waters. As stormwater travels over these surfaces it picks up pollutants that are not naturally found in receiving waters. The increased runoff, or stormwater, has also changed the water flow regime in our creeks, rivers and at the coast. With less infiltration into the soil and groundwater, our soils are depleted of the moisture they need to sustain vegetation, and higher flow in urban waterways results in greater erosion of stream banks and beds, further adding to the pollutant load. Stormwater pollution does not usually come from one readily identifiable source. Instead, it can come from a large range of sources over a large area that, cumulatively, have significant environmental impacts.

Stormwater containing high sediment and nutrient loads has been found to impact on seagrass health and sediment stability along the Adelaide coastline. The *Adelaide Coastal Waters Study* (Fox *et al* 2007) found that the loss of more than 5 000 hectares of seagrass along the Adelaide metropolitan coast could be attributed to pollution, some of which is due to stormwater contamination. It may also impact on recreational experiences and aesthetic values of the Adelaide coast.

The *Adelaide Coastal Water Quality Improvement Plan* provides strategies to improve coastal water quality and our understanding of water quality issues across the Adelaide region. One of these strategies is to promote action people can

take to improve water quality. Rain Garden 500 and the broader Catchment to Coast project is part of this strategy, and is one way people can be involved in improving water quality in the catchments that are connected to the Adelaide coast.

Rain gardens also offer other benefits. Not only do they improve the quality of stormwater, they also retain some of the excess stormwater generated by paved surfaces within the local soil profile, rather than allowing it to flow out to sea, and enable vegetated areas to be sustained over time, thus beautifying our streets and neighbourhoods.

Even if you don't install a rain garden, there are actions you can take around your home, school or community neighbourhood that will improve water quality and ensure only rain goes into stormwater drains:

- Use chemicals such as fertilisers sparingly, and dispose of them responsibly.
- Sweep up leaves around your home and put them in a green bin or compost—never sweep them into the street gutters or hose them down the drain.
- Wash cars on the lawn so the water does not flow into the stormwater drain or use a commercial wash area where water is recycled.
- Dispose of chemicals, such as paint or oil, responsibly rather than down the drain.
- Clean up after pets and don't allow water from washing pets into the stormwater drain.
- Have gravel or permeable driveways which allow rainwater to soak into the ground.

All these actions will help improve water quality in urban waterways across Adelaide's catchments and also improve water quality at the coast.

PART 2 – Eligibility criteria

What is eligible?

Proposed rain gardens must represent current best practice in respect to their planning, community engagement, design, documentation, construction, establishment and ongoing management, monitoring and maintenance. Eligible projects are to be located in the Adelaide region within catchments that discharge to the coast. This is indicated in Figure 1. If you are not sure whether your project falls within the project area, please contact the EPA.

The term 'rain garden' has been broadly used for a wide range of structures that manage stormwater. To be eligible for funding, the rain garden must be designed as a bio-filtration (bio-retention) system. It must incorporate a saturated zone and use plants that are native to the Adelaide region and suited to both nutrient and sediment removal. Technical considerations are further detailed in Part 3 of this guide.

The rain garden may be a single rain garden bed or a series of rain gardens. The rain garden or gardens may be part of a larger project with other components. However, if it is part of a larger project, only the bio-filtration rain garden component will be considered eligible for funding. The costs associated with some of the planning and design works, construction materials (including the filter media) and construction activities, and the purchase of suitable native plant species are eligible costs to be covered under Rain Garden 500 funding. However, the majority of Rain Garden 500 funds are to cover the costs of materials for installing the rain gardens and appropriate plantings.

The amount of funding available for any one project ranges from \$3 000 to \$50 000. If the cost of your project is greater than this amount, please contact the EPA to discuss options for staging the project over several years or look at alternative sources of funding for some components of the project work.

Only projects that contribute an equivalent in-kind and/or financial commitment to the amount of funding being sought from Rain Garden 500 will be considered.

Projects must be developed in partnership with the landholder and/or community, and the council responsible for the area in which the project is located. In most cases, some form of local government or local land manager approval may be required before you can proceed with the installation of your rain garden. Please seek this information from the relevant groups before you submit your application. For example, a school working with adjacent property owners to have rain gardens located along a school property boundary should develop their rain garden project with guidance from local government or other landholders where applicable. Projects that have all relevant approvals in place when submitting applications are more likely to be funded. See Part 4 of this guide for further details.

Rain Garden 500 is a three-year program with funds available in the financial years 2015–16, 2016–17 and 2017–18. You must be able to demonstrate that you have the capacity to deliver the project in the financial year in which you have applied to receive the funds. If you apply for funding for the financial year 2016–17, you must complete a full application. If you apply for funding for the subsequent financial year, you may complete an expression of interest, with a full application in April prior to the financial year in which you intend to apply for funds (or at other times as advertised). Completing an expression of interest will ensure you are kept informed of the project and technical workshops that will be delivered from time to time as part of the overarching Catchment to Coast project. These will be promoted on the Water Sensitive SA website www.watersensitivesa.com

All projects must be able to demonstrate that the rain garden structure can be maintained for 10–15 years after completion. It must be registered on a relevant asset register for a site or local area, and commitment must be made to ensure it becomes part of an asset maintenance program.

Project progress reporting should be completed according to the EPA and Australian Government requirements for reporting on project works. See Part 4 of this guide for further details. Milestones for project works need to be included in the delivery of project activities. If you cannot agree to the conditions for receiving project funding, then your proposed project may not be eligible for funding.

Please note: There is an intention to have project site and summary information presented on the Water Sensitive SA website. If project proponents cannot agree to allow this information to be publically available, the proposed project may be less likely to be supported through the Rain Garden 500 program.

What is not eligible?

The following systems will not be eligible for funding. However, they may form part of a broader project in which the rain garden sits:

- wetland systems
- rainwater tanks and rainwater tank diversions
- porous or permeable paving
- green roofs
- gross pollutant traps.

Projects that will also not be eligible for funding are those:

- outside the designated area – not in the Adelaide region of catchments draining to Adelaide's coastal waters (see Figure 1)
- where no or minimal financial commitment (either equivalent in-kind or financial) is made by the applicant or other partner groups involved in the project
- that cannot demonstrate partnership or consultation with the landholder, community or relevant council. Projects will be considered more favourably for receiving funding if they do involve sign off on the application by all relevant groups and land managers. If this section of the application is not signed by all relevant groups, the project may be considered ineligible for the assessment process and the application returned so all parties can demonstrate support of the application prior to the application being considered
- without a long-term ability to be monitored and reported on, and unable to maintain the rain garden.

Funding will not be provided for activities and/or expenses that:

- involve the purchase of land
- include planting non-native species within a project site
- include planting species that are known to be or could become environmental or agricultural weeds in or near the project location
- principally support business development activities.

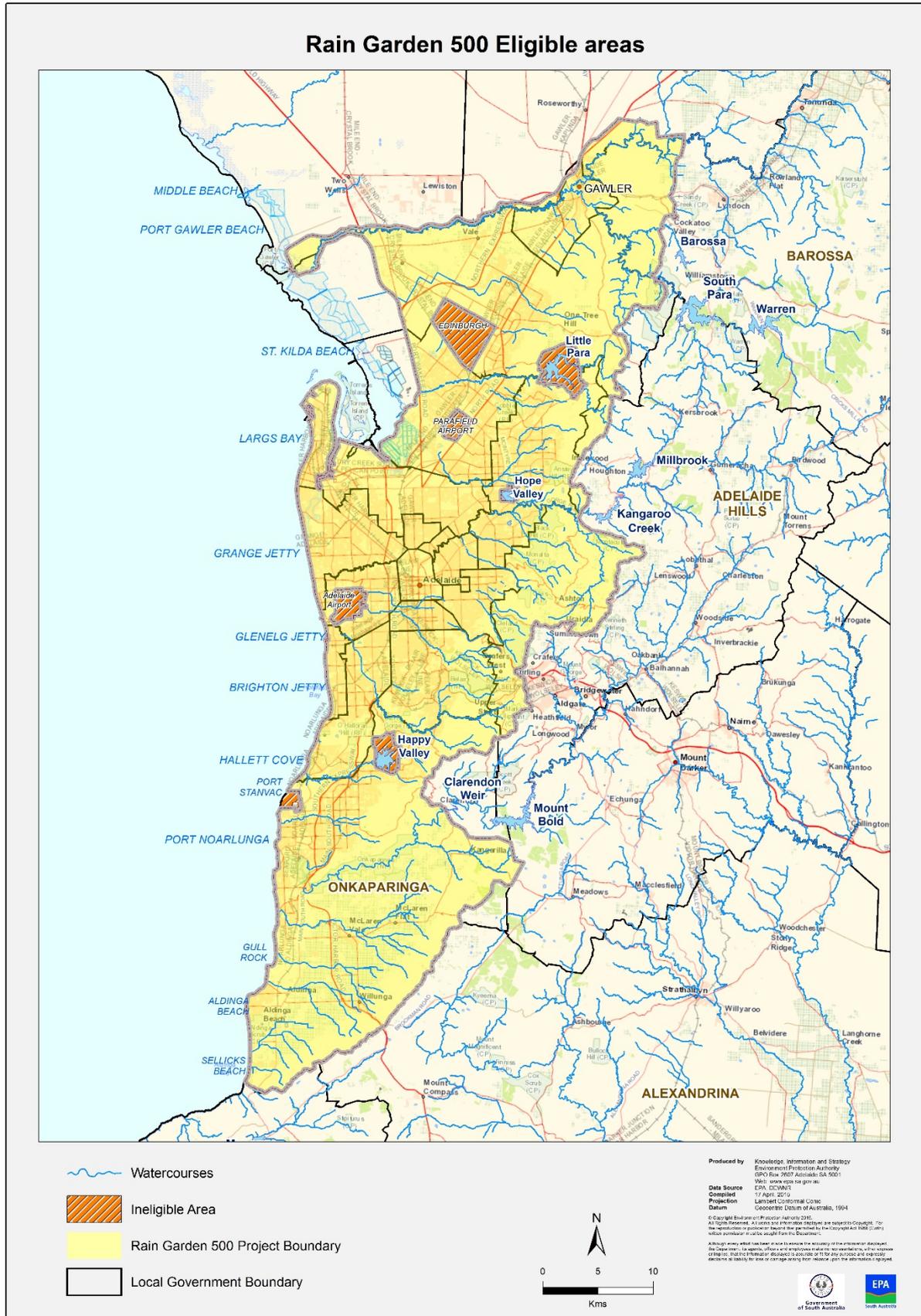


Figure 1 Eligible project area

PART 3 – Technical information

This section outlines the design process for rain gardens for optimal performance, incorporating a number of technical considerations in addition to implementation and maintenance.

Reference documents

The following is the key reference document that should be consulted for more specific design information: [Adoption guidelines for stormwater biofiltration systems](#) (Cooperative Research Centre for Water Sensitive Cities) (Adoption guidelines). These guidelines are an updated version of those previously developed by the Facility for Advancing Water Biofiltration (FAWB). The Adoption guidelines are based on extensive and evolving research to provide scientific 'proof of concept' for the application of stormwater bio-filter technologies and facilitate industry-wide adoption and implementation.

The [Adoption guidelines for stormwater biofiltration systems – Summary report](#) (Adoption guidelines summary) provides a summary of key design, construction and maintenance considerations cross- that are referenced to, and further outlined in, the [Adoption guidelines for stormwater biofiltration systems](#). Of further assistance are the Adoption Guidelines for Stormwater Biofiltration System Fact Sheets which can be found in Appendix A1 to A7 of the [Adoption Guidelines](#).

Technical considerations

This guide does not replace the referenced guidelines, but seeks to ensure some key features are considered when you are designing and constructing your rain garden for conditions in the Adelaide region and for the Rain Garden 500 project. It is recommended that you follow the Technical considerations outlined in the [Adoption guidelines for stormwater biofiltration systems – Summary report](#) and refer to the appropriate section of the Adoption guidelines as needed. Key components of rain garden bio-filtration systems that must be considered are shown in Figure 2.

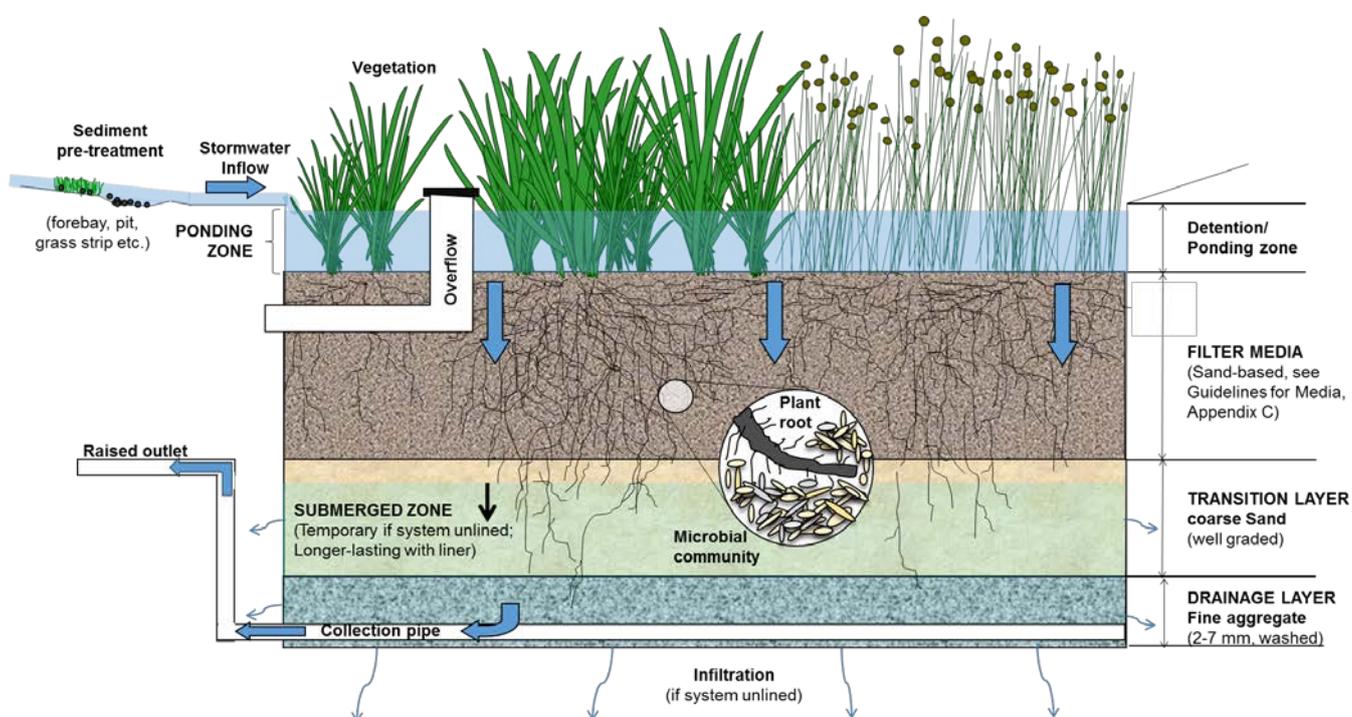


Figure 2 Main components of bio-retention systems

Source: *Adoption Guidelines for Stormwater Biofiltration Systems* Version 2, CRC for Water Sensitive Cities (2015).

It is recommended that the installation of a rain garden bio-filtration system is part of an overall water sensitive urban design (WSUD) strategy, stormwater management plan or site sustainability plan that promotes multiple objectives.

Attention is drawn to the state-wide performance targets outlined in: [Water sensitive urban design: Creating more liveable and water sensitive cities in South Australia](#) (Department of Environment, Water and Natural Resources (DEWNR)) and reproduced in part in Table 1. A rain garden biofiltration system should be considered in light of these principles and performance targets and an overarching WSUD strategy.

Table 1 Statewide WSUD performance principles and targets

Performance principle	Performance principle intent	State-wide performance target
<p>Runoff quality</p> <p>Positively manage the quality of urban runoff through implementing water sensitive urban design.</p>	<p>Help protect and, where required, enhance, the quality of runoff entering receiving water environments, in order to support environmental and other water management objectives.</p>	<p>Achieve the following minimum reductions in total pollutant load, compared with that in untreated stormwater runoff, from the developed part of the site:</p> <ul style="list-style-type: none"> • total suspended solids by 80% • total phosphorus by 60% • total nitrogen by 45% • litter/gross pollutants by 90%.
<p>Runoff quantity</p> <p>Post-development hydrology should, as far as practical and appropriate, minimise the hydrological impacts of urban built environments on watercourses and their ecosystems.</p>	<ul style="list-style-type: none"> • Help protect waterways and, where relevant, promote their restoration by seeking to limit flow from development to pre-development levels. • Help to manage flood risk, by limiting the rate of runoff to downstream areas to appropriate levels. 	<p>For waterway protection</p> <p>Manage the rate of runoff discharged from the site so that it does not exceed the pre-urban development one-year average recurrence interval (ARI) peak flow.</p>
		<p>For flood management</p> <p>For development and other relevant infrastructure that will drain runoff to an existing publicly managed drainage system or to a drainage system such as a creek or watercourse on privately-owned land:</p> <ul style="list-style-type: none"> • the capacity of the existing drainage system is not exceeded • there is no increase in the five-year ARI peak flow and no increase in flood risk for the 100-year ARI peak flow, compared with existing conditions.
<p>Integrated design</p> <p>The planning, design and management of WSUD measures seek to support other relevant state, regional and local objectives.</p>	<p>Implement WSUD in a way that promotes establishment of 'green infrastructure' and achievement of multiple outcomes, for example, public amenity, habitat protection and improvement, reduced energy use and greenhouse emissions, and other outcomes that contribute to the wellbeing of South Australians.</p>	<p>Show evidence that relevant stakeholders are engaged at appropriate stages of planning, designing, constructing and managing WSUD measures so as to maximise the potential for WSUD to contribute to 'green infrastructure' and other relevant state, regional, and local objectives.</p>

Source: [Water sensitive urban design: Creating more liveable and water sensitive cities in South Australia \(DEWNR\)](#), www.environment.sa.gov.au/files/sharedassets/public/water/water-sensitive-urban-design-policy-gen.pdf

Incorporation of rain-garden bio-filtration should always be considered in the early planning phase of any new development or redevelopment. It is also essential that staff responsible for the system into the future, such as landscapers and maintenance staff, are included in the early planning, and not just those responsible for design and construction.

Characteristics of the catchment, such as size, land use and flow rates, must be considered in your design. For example, a catchment with high leaf litter and one under development or containing a commercial area may require different approaches in design. The design of a bio-filtration rain garden in a quiet residential street will be different to one in an industrial area, and it is imperative that you consider the nature of the catchment in the design (see Figure 3). In the Adelaide region, key pollutants of interest to coastal waters are sediment and nitrogen. In addition, other pollutants, such as phosphorus and metals, are important to waterway health in the catchments. The following considerations, are focused on enhancing removal of these pollutants.



Figure 3 Catchment characteristics: busy roads, industrial areas, quiet suburban streets and types of leaf litter

Submerged zones

Submerged or saturated zones, buffer biofiltration systems during dry periods by supporting the plants and microbes. Having a submerged zone enhances the recovery of the system after a dry period and is demonstrated to significantly improve treatment performance, particularly for nutrient removal, including nitrogen, which is a pollutant of interest in the Adelaide Coastal Waters region. The Adelaide region also has extensive periods between rainfall events, and the inclusion of a submerged zone is considered essential to maintain healthy plants, the viability of the system and enhancing nitrogen removal.

A saturated zone of 450 to 500 mm is considered fundamental to the design. Adding a low-nutrient carbon source in the saturated zone has also been found to enhance nitrogen and phosphorus removal. Suitable materials include pine chips without bark or pine sawdust and low-nutrient mulch.

A transition layer (washed sand) between the filter media and a saturated zone of 100 mm is recommended so that the filter media is not permanently saturated, which would likely lead to nutrient leaching. Please refer to the Adoption guidelines summary and Section 3.6.3 page 72–73 of the Adoption guidelines for further information,

Inflow elements

The inlet needs to ensure flows are evenly distributed over the surface of the system and minimise velocity to reduce erosion and scour. An even distribution of water over the whole surface area maximises the full filter media and, therefore, maximises vertical filtration and even distribution to the plants. It will also reduce the risk of build up of sediment and pollutants immediately adjacent to the inlet. Consideration of a **sediment forebay** or other mechanism to

capture sediment prior to the bio-filtration system may be necessary. The need to manage sediment and the potential for sediment may be determined by catchment characteristics. Considerations include:

- amount of development occurring in the catchment. Installation of bio-filtration systems in developing areas requires careful consideration so that the asset is not damaged during the development stage. If bio-retention is to be installed in areas under significant development, pre-treatment to remove sediment is a must, or arrangements must be made for bypassing the bio-filtration system during the construction phase, so that sediment does not accumulate and reduce the effectiveness of the system
- high traffic areas, such as major roads. These produce much greater sediment and tyre rubber—major roads are different from side roads and may require appropriately modified structures
- size of the catchment. The larger the catchment the larger the pollutant load, and the greater chance of sediment.

Ensuring the bio-filtration is sized (total area) as a suitable proportion of the contributing catchment area will assist with ensuring less build up of sediment. Ideally, the bio-filtration system filter area should be no less than 2% of the impervious area of the contributing catchment. See comments on following pages about sizing of rain gardens. In some locations, an appropriately sized sediment basin or swale areas, or an initial sacrificial rain garden where it is acknowledged that the sacrificial rain garden will need replacing more often than the recommended 10-15 years for rain garden replacement, could be used as sediment traps to protect downstream rain garden areas from becoming inundated with sediment from catchments generating high sediment loads.

Consideration of **leaf litter** type (such as native or deciduous, quantity and timing of fall) is of importance in the design of the inlet structure. Again, relate this back to the nature of the catchment and whether a high leaf loading is anticipated, for example, large amounts from deciduous trees in autumn or particular native species that lose leaves in hot weather. You will need to consider **maintenance** of the inlet when designing the inlet structure. For example, will the design allow easy access for a street sweeper to remove leaf litter and sediment? The characteristics of the catchment will affect the type of inlet structure required and how the design can best support adequate maintenance.

An overflow structure determines the ponding or extended detention depth, and essentially the volume of water that is detained and treated, and needs to be set at the level of the maximum ponding depth. Once this level is reached, water overflows or bypasses. The appropriate depth of extended detention will depend on site constraints, but should be between 100-300 mm. This means that the overflow pit must be set higher than the filter media to allow this level of water to accumulate during a rain event before it overflows.

Please refer to the Adoption guidelines summary and Section 3.6.3 of the Adoption Guidelines for further information,

Filter media

The filter media traps pollutants and supports plants and microbes. The *Guidelines for Filter media in stormwater biofiltration systems* (Appendix C of the [Adoption guidelines](#)) has a number of recommendations, also summarised in Table 3 of the Adoption Guidelines Summary. Recommendations include hydraulic conductivity between 100 and 300 mm/hour and a depth of 400–600 mm. As part of the overarching Catchment to Coast project, the following South Australian councils have installed rain garden demonstration sites in the Adelaide metropolitan region:

- City of West Torrens
- City of Unley
- City of Adelaide.

These councils can be contacted, to speak with the relevant project managers, about specifications of filter media suitable to South Australian conditions and suppliers that may be able to provide this filter media.

Plants

Research undertaken indicates that plants are essential for removing nutrients, in particular, nitrogen, in addition to assisting with maintaining infiltration within the system. This research has also determined that some plant species are more efficient at nutrient removal than others and at least 50% of your plantings should be effective at removing nitrogen.

It is recommended that plants have extensive fibrous root systems, and that there is a mix of shallow and deep rooted plants, a mix of both fast and slow growing plants and plants should be tolerant to wetting and drying cycles. Having a variety of plants will provide a more robust system that can better tolerate varying conditions. Desirable plant traits for nitrogen removal, as indicated by the Adoption Guidelines, include:

- high relative growth rate
- high root surface area
- high root : shoot ratio
- high total root length
- high proportion of fine roots
- high total root, leaf and shoot biomass

The indigenous flora of the Adelaide Plains and Mount Lofty Ranges includes several species adapted to varying degrees of seasonal inundation as well as drought (wetting and drying cycles). This provides us with several species suitable for use in bio-filtration rain gardens. The research undertaken in different climatic zones has identified a range of species that demonstrate high nutrient removal capacity, many of these species occurring in the Adelaide region. Plant species listed in Table 2 have proven to be effective at nitrogen removal and are native to the Adelaide region. At least 50% of the plants you select for a bio-filtration rain garden must be from this group.

Table 2 Plant species native to the Adelaide region proven to be effective at nitrogen removal

Demonstrated effectiveness at nitrogen removal	Comment
<i>Carex appressa</i>	
<i>Carex tereticaulis</i>	
<i>Goodenia ovata</i>	
<i>Ficinia nodosa</i>	Formerly <i>Isolepis nodosa</i>
<i>Juncus amabilis</i>	Less common Juncus species in the Adelaide region
<i>Juncus flavidus</i>	Less common Juncus species in the Adelaide region
<i>Juncus pallidus</i>	
<i>Juncus subsecundus</i>	
<i>Juncus krausii</i>	
<i>Baumea juncea</i>	
<i>Baumea rubiginosa</i>	Wet dependent species
<i>Baumea articulate</i>	
<i>Poa poiformis</i>	
<i>Cyperus gymnocaulos</i>	

You can use other plant species. Species within the same genus may be expected to demonstrate similar nitrogen removal performance in the context of similar environments. However, it is recommended that you choose those with the desirable traits and, since nitrogen is a pollutant of interest to the Adelaide coastal waters region, at least 50% of the plants in your rain garden must be from those listed in Table 2. Some plant species that may be suitable for biofiltration systems, but are not proven to be effective at nitrogen removal, are listed in Table 3. No more that 50% of plants should be from this group. If you are using plants not on either plant list, they must be plant species native to the Adelaide region. Their origin can be checked in [Australia's species | Atlas of Living Australia](#).

When designing your rain garden consideration of the placement of species in appropriate positions corresponding to inundation frequency and drought tolerance is needed. Generally those areas of the rain garden closest to the inlet will be inundated more frequently, and those furthest from the inlet less frequently. While the batters may remain quite dry and require terrestrial plants. The choice of plants for these different areas of the rain garden must be considered. A holistic

design approach is essential – considerations may include trees and shrubs for shade, tap rooted plants to maintain filter media infiltration, spreading plants to negate the need for mulch and inundation zones (how often each area receives flows). Integration into the local landscape and community support is enhanced when the rain garden looks attractive and this should also be considered when choosing plant species. It is also essential that plantings are undertaken at the right time of year. They should be planted either at the beginning of winter or, if planted at other times, they will require watering with an alternative supply while they establish themselves. If you construct a bio-retention bed in summer, you should delay plantings until late autumn/winter.

Section 3.6.5 (page 86) of the [Adoption Guidelines](#) provides further details and tips on plant selection. It is also anticipated that Water Sensitive SA will release a fact sheet on biofiltration plants in early 2016. Check their website at www.watersensitivesa.com

Table 3 Plants that may be suitable for rain gardens, but not proven effective at nitrogen removal

No demonstrated effectiveness, or not effective, at nitrogen removal	Plant form	Comment
<i>Bolboschoenus caldwellii</i>	Sedge	Spreading sedge, often coastal
<i>Carex bichenoviana</i>	Sedge	Spreading sedge
<i>Carex inversa</i>	Sedge	Low sedge
<i>Carex inversa</i> var <i>inversa</i>	Sedge	Spreading sedge
<i>Chorizandra enodis</i>	Sedge	Spreading sedge
<i>Elocharis acuta</i>	Sedge	Spreading sedge
<i>Gahnia filum</i>	Sedge	Coastal
<i>Gahnia sieberiana</i>	Sedge	Adelaide Hills
<i>Gahnia trifida</i>	Sedge	Coastal
<i>Juncus pauciflorus</i>	Sedge	Medium sedge
<i>Lepidosperma gladiatum</i>	Sedge	Coastal
<i>Lepidosperma laterale</i>	Sedge	Adelaide Hills
<i>Calocephalus citreus</i>	Herb	Flowering
<i>Chrysocephalum apiculatum</i>	Herb	Flowering
<i>Chrysocephalum semipapposum</i>	Herb	Flowering
<i>Cotula australis</i>	Herb	Spreading riparian herb
<i>Crassula helmsii</i>	Herb	Spreading riparian herb
<i>Dichondra repens</i>	Herb	Spreading herb
<i>Helichrysum leucopsidium</i>	Herb	Coastal
<i>Helichrysum rutidolepis</i>	Herb	Adelaide Hills, rare but easily cultivated
<i>Hydrocotyle verticillata</i>	Herb	Spreading riparian herb
<i>Lotus australis</i>	Herb	Flowering
<i>Marselia drummondii</i>	Herb	Spreading riparian herb
<i>Mentha australis</i>	Herb	Spreading herb, rare but easily cultivated
<i>Mentha diemenica</i>	Herb	Spreading herb, rare but easily cultivated
<i>Pelargonium australe</i>	Herb	Spreading herb
<i>Ranunculus lappaceus</i>	Herb	Adelaide Hills
<i>Samolus repens</i>	Herb	Spreading riparian herb
<i>Scaevola albida</i>	Herb	Spreading herb
<i>Selliera radicans</i>	Herb	Spreading riparian herb

No demonstrated effectiveness, or not effective, at nitrogen removal	Plant form	Comment
<i>Wahlenbergia luteola</i>	Herb	Spreading herb
<i>Wahlenbergia stricta</i>	Herb	Spreading herb
<i>Carprobrotus rossii</i>	Mat	Spreading succulent
<i>Disphyum crassifolium</i>	Mat	Spreading succulent
<i>Kunzea pomifera</i>	Mat	Coastal
<i>Mimulus repens</i>	Mat	Spreading riparian herb
<i>Myoporum parvifolium</i>	Mat	Spreading herb, coastal
<i>Dianella brevicaulis</i>	Lily	Coastal
<i>Dianella revoluta</i>	Lily	Strappy
<i>Lomandra multiflora</i> ssp <i>dura</i>	Lily	Strappy
<i>Distichlis distichophylla</i>	Grass	Spreading grass, coastal
<i>Microlaena stipoides</i>	Grass	Prefers shade
<i>Rytidosperma auriculata</i>	Grass	<i>Rytidosperma</i> sp formerly <i>Austrodanthonia</i> sp
<i>Rytidosperma caespitosum</i>	Grass	Tall
<i>Rytidosperma carphoides</i>	Grass	Low
<i>Rytidosperma geniculata</i>	Grass	Low
<i>Rytidosperma racemosa</i>	Grass	Medium
<i>Adriana quadripartita</i>	Shrub	Mainly coastal
<i>Banksia marginata</i>	Shrub	Flowering
<i>Bursaria spinosa</i>	Shrub	Butterfly attracting, may require pruning
<i>Callistemon rugulosus</i>	Shrub	Flowering
<i>Callistemon sieberi</i>	Shrub	Adelaide Hills
<i>Goodenia varia</i>	Shrub	Coastal
<i>Grevillea ilicifolia</i>	Shrub	Low Shrub, rare but easily cultivated
<i>Leucophyta brownii</i>	Shrub	Lily
<i>Melaleuca decussata</i>	Shrub	Adelaide Hills
<i>Melaleuca brevifolia</i>	Shrub	Flowering
<i>Pomaderris paniculosa</i>	Shrub	Coastal
<i>Scaevola crassifolia</i>	Shrub	Coastal
<i>Eucalyptus cosmophylla</i>	Tree	Adelaide hills, small tree
<i>Melaleuca lanceolata</i>	Tree	Small Tree
<i>Pittosporum angustifolium</i>	Tree	Small tree

Sizing

It is generally recommended that the surface area of the bio-retention system is 2% of the impervious area of the contributing catchment. If the contributing catchment is an industrial area, where metals are prevalent, the depth of the filter media should be at least 500 mm, and consideration should be given to increasing the size to up to 4% of the contributing catchment to assist with extending the life of the bio-filter. Seek advice from your relevant local government contacts and your design engineers on determining the catchment area for establishing the size of a rain garden that would be best suited to your site.

Mulch

Mulch is generally not recommended as it inhibits the spread of plants and there is a risk of clogging of overflow pits. However, in some circumstances there may be merit in a cover that assists with retaining moisture and suppressing weeds, particularly while vegetation is being established. Organic mulch is not recommended as it can contribute to stormwater pollution in heavy rain events. A gravel mulch may be appropriate, but it should be white, to reflect heat, rather than darker colours that absorb heat and stress plants. Use of gravel mulches will also constrain the spread of plants and clogging of the overflow pits would need to be monitored. Councils that have successfully installed rain gardens in the Adelaide region have found that a mulch layer is not needed if a jute matting surface is used for planting. Alternatively, use some companion plants that will spread across the surface. Note if using spreading plants jute matting should not be used as plants may grow under the matting. Ideally, plantings should be dense and cover the full rain garden area, leaving minimal bare surfaces in the rain garden. For further advice about this, speak with your local council or EPA staff for advice on what to do for your site.

Drainage layer

The drainage layer collects the treated water and conveys it to the outlet. The drainage layer material is gravel, and the Adoption guidelines recommend 2-7mm washed screenings. These must be pre-washed to ensure any fine particles within the supplied material do not wash out of the drainage layer. If the submerged zone is sand, then a minimum cover of 50mm is recommended. If the submerged zone is gravel, then this may also serve as the drainage layer. Further considerations of underdrains are considered in Section 3.6.4 of the [Adoption Guidelines](#). When ordering your supplies for the rain garden, ensure you always ask for pre-washed materials to be delivered to your project site. It will be very costly and can be very time consuming to have to do this after delivery has taken place of unwashed materials. If materials are not washed, they will result in rain gardens not operating as they should, as high loads of fine materials of silt will enter the drainage layer causing clogging of the voids (water storage space between the gravel).

Maintenance

The design of a rain garden needs to consider maintenance, as this is important for managing long-term costs, including ways that maintenance crews and vehicles can access the rain garden. For example, if contract traffic control services are required for clean out and maintenance work on the rain garden, this will add to the ongoing costs that local government may need to consider in supporting the rain garden installation. The design of your rain garden should consider how the area will be maintained in a cost-effective way. Input from relevant maintenance staff is critical. Once built, the asset must be incorporated in the asset management plan of the relevant site or council area where the rain garden is installed. You should consider the requirements and methodology for maintenance during the design phase, and incorporate this into a long-term maintenance plan. Section 4.3 of the [Adoption Guidelines](#) provides further information on maintenance.

Siting

Siting of a rain garden will need to involve consideration of underground services, drainage, traffic, parking, pedestrian safety and other existing infrastructure. Access for other services, such as rubbish collection and truck access to residents' bins, also requires consideration.

Traffic controls

Vehicle traffic can damage the structures within a rain garden and will compact the filter media reducing infiltration. Consider maintenance traffic in the ongoing management and monitoring of your rain garden. Protection of a rain garden from vehicular traffic will require consideration in the planning phase of the project.

Signage

All rain gardens constructed as part of the Rain Garden 500 project will be required to erect signage displaying a standard description and partner acknowledgement of the project. A standard sign will be provided, but if you wish to

design your own interpretive-style signage relevant to the specific site, guidance will be provided on mandatory elements for this signage, such as placement of logos and wording for acknowledgements.

Detailed design

The detailed design of your project is an important step for ensuring all components of the rain garden are considered. For many projects, this will be undertaken once funding has been granted. Appendix 1 of this guide contains a 'Design details checklist' to assist successful applicants with ensuring the minimum details have been considered. It may also be useful to applicants for understanding the design information that will be required as part of the project reporting process. Every project will be different, and the checklist is not exhaustive. Depending on the project, other design information may be required.

PART 4 – Budgets and project monitoring and reporting

Budget

It is essential you provide adequate information on the proposed project budget in your application. This information will also form part of the contract should the application be successful and should be as accurate as possible.

The budget summary should clearly outline a breakdown of expenses for the different phases – detailed design, construction, planting, signage, partner contributions and Rain Garden 500 contribution. It should consider contingencies, project management and volunteer hours.

The budget may include in kind support as an applicant contribution, eg staff time in project management or volunteer time. If in kind support is listed as a contribution provide a breakdown of how this is determined. An example of the information being sought is outlined in Appendix B.

Progress and final reports

If your application is successful, progress and summary reports will be required. The number of progress reports required will be dependent on the scale of the project, but will generally be required for each milestone indicated on the application form. For smaller projects, please only indicate three to four major milestones for project works. However, larger projects may have a greater number of project milestones linked to project payments.

Information contained in the reports submitted to the EPA will be used in reporting from the EPA to the Australian Government on the overall five-year project: 'Catchment to coast focus for water quality improvement across urban Adelaide'.

Reporting information could also be provided to the Adelaide Coastal Waters Steering Group who will oversee the implementation of the Adelaide Coastal Water Quality Improvement Plan as well as reported on the Australian Government National Landcare Programme website. Site and project summary information on all Rain Garden 500 projects will also be made available as dots on a map, with a summary of project information, on the Water Sensitive SA website.

List of information to be included in progress and final reports:

- project money spent and in-kind contributions to the project from yourself and others, such as community groups and volunteers, and secondary stakeholder support from organisations such as local government and natural resource management groups
- photographic records of the WSUD site pre-construction, during construction and post-construction, and during planting and post-planting
- photos taken of installed signage at sites and electronic pdf copies of signage content, to be provided in final reporting if development of additional interpretive signage is undertaken at sites
- details on the number of volunteers contributing to project activities, eg student involvement in planting days or attendance at field days and events at project site
- promotional, communications and media coverage of project at the local or regional level, eg community and school newsletters or local Messenger articles
- any extension activities that have been initiated or undertaken as a result of the funded project. However, funding of these may be beyond the scope of this project. Extension activities may include: development of mobile applications to promote information on WSUD demonstration sites downloadable from scanning information on signage (QR code); or group input to Rain Garden 500 training workshops and events
- details of monitoring undertaken for site eg, litter surveys and collections (could be linked to days such as Clean Up Australia Day or World Environment Day), photo monitoring and other on-site monitoring of plant growth over time or any water quality monitoring undertaken at the site before, during and/or after construction of rain garden.

Financial statements

Annual financial statements are required for the grant. You must prepare these statements in accordance with the Australian Accounting Standards. Further information will be provided to successful applicants on the required financial statements. At least, the statements should include an acquittal prepared using the template to be provided, but for some grants other statements, including a statement of financial performance, statement of financial position, cash-flow statement and/or statement of changes in equity, may be required.

PART 5 – Community and stakeholder engagement

An important component of the project is to build an understanding in the community of the importance of improving stormwater quality, where and how rain garden installations may be incorporated and how they can contribute collectively to improved stormwater quality and, ultimately, improved coastal water quality and seagrass health. As Rain Garden 500 is a grant program under a larger Catchment to Coast Australian Government funded project, all projects will also be linked via website information to Catchment to Coast activities. The key message for the community to be delivered by any project is that actions they take on the land can impact coastal water quality.

Standard signage must be erected at project sites (see 'Signage' section in Part 3 of this guide) that outlines the purpose of the rain garden and acknowledges project partners, including the Australian Government funding support of these projects. Alternatively, you may wish to develop more detailed interpretative signage that also outlines the purpose of the rain garden and acknowledges project partners, including the Australian Government funding support of projects. Additionally, project information, including site and project summary details, will be made available through the Water Sensitive SA website, with a link to the online project case study available via a QR code in the relevant signage.

The proposed rain garden should be developed in partnership with local landholders and/or the community, or the relevant local council. Applicants will need to demonstrate that this consultation has been undertaken, and any local government requirements for rain garden installation and project work are to be adhered to as part of project implementation. If a council is developing rain gardens in a streetscape, then adjacent landholders should be consulted to ensure they understand the function of the rain garden and have long-term ownership of the project.

All projects are strongly encouraged to engage with the Kaurna people and this should be incorporated into the communications and engagement strategy for your project. The *Catchment to Coast* Aboriginal Engagement Officer is based at the Living Kaurna Cultural Centre and will be in contact with you to discuss your project. The officer may be contacted on M: 0467066294 or email catchment2coast@outlook.com.au

If a community group or school is undertaking a project, then it is essential that you liaise or partner with the local council. If it is the intention to discharge the treated water to the stormwater system, then it is essential that the council's requirements to do so are adhered to. If needed, please contact EPA staff for support and discussion of ideas for developing your rain garden project's community and stakeholder engagement plan as part of your overall project.

PART 6 – Completing your application

All application forms are available online at the [EPA website](#).

Applications for funding for the financial year 2017–18 must complete a full [application form](#).

To be eligible for funding, **your application must be received by 5 pm Wednesday, 21 June 2017**

Paper copies should be submitted to:

Shiloh Gerrity
Rain Garden 500 applications
Environment Protection Authority
GPO 2607
Adelaide SA 5001

Electronic copies may be submitted to: [<epainfo@sa.gov.au>](mailto:epainfo@sa.gov.au).

Bibliography

- Deletic A, McCarthy D, Chandrasena G, Li Y, Hatt B, Payne E, Zhang K, Henry R, Kolotelo P, Randjelovic A, Meng Z, Glaister B, Pham T & Ellerton J 2014, *Biofilters and wetlands for stormwater treatment and harvesting*, Cooperative Research Centre for Water Sensitive Cities, Monash University, Victoria.
- Department of Environment, Water and Natural Resources (nd), *Water sensitive urban design: Creating more liveable and water sensitive cities in South Australia*, DEWNR, Adelaide.
- Facility for Advancing Water Biofiltration (FAWB) 2009, *Stormwater biofiltration systems adoption guidelines: Planning, design and practical implementation Version 1*, Monash University, Victoria.
- Fox D, Batley G, Blackburn D, Bone Y, Bryars S, Cheshire A, Collings G, Ellis D, Fairweather P, Fallowfield H, Harris G, Henderson B, Kämpf J, Nayar S, Pattiaratchi C, Petrusевичs P, Townsend M, Westphalen G & Wilkinson J 2007, *The Adelaide coastal waters study: Final report, Volume 1 Summary of study findings*, CSIRO, Adelaide.
- Glaister B, Fletcher T, Cook P & Hatt B 2014, 'Co-optimisation of phosphorus and nitrogen removal in stormwater biofilters: The role of filter media, vegetation and saturated zone', *Water Science and Technology*, vol. 69(9), pp 1961–1969.
- Hatt B, Steinel A, Deletic A & Fletcher T 2011, 'Retention of heavy metals by stormwater filtration systems: Breakthrough analysis', *Water Science and Technology*, vol. 64(9), pp 1913–1910.
- Environment Protection Authority 2013, *Adelaide Coastal Water Quality Improvement Plan (ACWQIP)*, EPA, Adelaide.
- Payne E, Pham T, Cook P, Glaister B, Fletcher T, Hatt B & Deletic A 2014, 'Biofilter design for effective nitrogen removal from stormwater: Influence of plant species, inflow hydrology and use of a saturated zone', *Water Science and Technology*, vol. 69(6), pp 1312–1319.
- Payne, E.G.I., Hatt, B.E., Deletic, A., Dobbie, M.F., McCarthy, D.T. and Chandrasena, G.I., 2015. *Adoption Guidelines for Stormwater Biofiltration Systems*, Melbourne, Australia: Cooperative Research Centre for Water Sensitive Cities.
- Payne, E.G.I., Hatt, B.E., Deletic, A., Dobbie, M.F., McCarthy, D.T. and Chandrasena, G.I., 2015. *Adoption Guidelines for Stormwater Biofiltration Systems - Summary Report*, Melbourne, Australia: Cooperative Research Centre for Water Sensitive Cities.
- Water by Design 2014, *Bioretention technical design guidelines (Version 1.1)*, Healthy Waterways Ltd, Brisbane.
- Zinger Y, Deletic A & Fletcher T 2007, 'The effect of various intermittent dry-wet cycles on nitrogen removal capacity in biofilter systems', paper presented to 13th International Rainwater Catchment Systems Conference and 5th International Water Sensitive Urban Design Conference, 21–23 August 2007, Sydney.

Glossary

Biofiltration	The process of improving water quality by filtering the water through a biologically influenced media. Stormwater is diverted into the bio-filtration system, where it ponds on the surface and flows through the vegetation, filtering down through the filter media. Treated flows can be infiltrated to underlying soils, or collected in an underdrain system for storage or conveyance downstream.
Bio-retention	The same process as bio-filtration – the process whereby contaminants and sediment are removed from stormwater by a bio-filtration system.
Nutrients	In stormwater, usually refer to plant nutrients nitrogen and phosphorus. They can cause excessive growth of algae and other plants, which can generally degrade ecosystem condition by clogging creeks and lakes and smothering seagrass habitat.
Rain garden	A garden designed to manage stormwater. For the Rain Gardens 500 project, a rain garden is a constructed garden designed to capture stormwater from roads, car parks, driveways, roofs and other hard surfaces, and are designed as bio-filtration gardens to improve the water quality of stormwater.
Sediment	A pollutant in stormwater, and the term usually refers to detached soil particles that reduce water clarity.
Stormwater	Also referred to as 'rainwater runoff', is rainwater that runs off surfaces where water cannot penetrate, such as roofs, driveways and roads.
Stormwater drainage network	A series of pipes that collect and transport stormwater. It is separate to the sewage system that transports wastewater.
Water Sensitive Urban Design	An approach to urban planning and design that integrates the total water cycle into urban development, promoting the sustainable use and re-use of water and integrating water from all sources.
WSUD	Water sensitive urban design

Appendix A – Design checklist

The following 'Design details checklist' is to assist successful applicants with ensuring the minimum details have been considered. This information will be required as part of the project reporting process. Every project will be different and, therefore, the checklist is not exhaustive. Depending on the project, other design information may be required. Provide design drawings where possible.

Design details checklist	
The following are the minimum design details that will be required as part of the reporting for your project. This is not an exhaustive list, and it is important to include all details relevant to your project.	
Confirm design meets water quality objectives (Refer to Table 1 in Part 3 of this guide)	
Forecast TSS removal	
Forecast TN removal	
Forecast TP removal	
Bioretention components	
Extended detention depth	
Filter media depth	
Filter media hydraulic conductivity	
Saturated zone depth	
Saturated zone material	
Drainage layer material	
Drainage layer depth	
Transition layer material	
Transition layer depth	
Inlet and inflows	
Minor design storm entering	ARI Peak flow rate
Major design storm entering	ARI Peak flow rate

Confirm design meets water quality objectives (Refer to Table 1 in Part 3 of this guide)	
Inflow structure (include information on any diversion)	
Sediment forebay (or other coarse sediment removal mechanism)	
Scour protection	
Overflow	
Overflow pit type (include dimensions)	
Overflow pit capacity	
Outlet pipe	
Vegetation	
Species Selection (effective nitrogen removal)	
Species selected (not effective for nitrogen removal)	
Planting density	
Flow estimates	
Estimated volume of stormwater to be infiltrated per annum	
Estimated volume of stormwater to be harvested for reuse per annum	
Other design information	

Appendix B – Example Budget Summary

This is an example only, please detail a breakdown of your project budget. All costs below are for illustration purposes only. Include 'in kind' support that your organisation is providing and itemise how this has been calculated in monetary terms.

Budget summary		
Please provide details of funding sought (only the bio-filtration component of larger projects will be considered eligible for funding). Provide a breakdown of expenses for different phases – detailed design, construction, planting, signage for the applicant contribution in addition to partner and Rain Garden 500 contribution		
	\$	Cost Breakdown. Include in kind support and how this is determined, eg estimated volunteer or staff time
Applicant contribution	1000	Detailed design
Community group	1000	Survey & setout
	5000	Earthworks/excavation/site preparation
	3000	Modifications to existing drain directing flows to the rain garden (eg construction of swale)
	1000	Overflow pit
	750	Liner
	500	Underdrainage
	500	Filter media
	1200	Planting - in kind 60 volunteer hours @ \$20 per hour
	300	Interpretive signage design – in kind 15 volunteer hours @ \$20 per hour
	2000	Project management and administration – in kind 50 hours @ \$40 per hour
		Subtotal
	(16250)	
Partner contribution (if applicable) eg Council ABC	4000	Kerb modification and new side entry pit
Rain Garden 500 contribution – amount being sought in funding application	1000	Detailed design
	1000	Survey & setout
	5000	Earthworks/excavation/site preparation
	3000	Modifications to existing drain directing flows to the rain garden (eg construction of swale)
	1000	Overflow pit
	750	Liner
	500	Underdrainage
	500	Filter media
	1000	Plants
	2000	Interpretive signage construction

	(15750)	Subtotal
Total project value	36000	