WATER SENSITIVE SA

Opportunities to integrate WSUD in high school STEM programs

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SA Local Government Officers Assoc.
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Water sensitive communities

Liveable

Sustainable

Photo: S.Bryars

Productive

Resilient

Water Sensitive SA Program Partners

WATER SENSITIVE SA

Natural Resources
Adelaide and Mt Lofty Ranges

LOCAL GOVERNMENT RESEARCH & DEVELOPMENT SCHEME

Australian Government National Landcare Programme
STORMWATER SOUTH AUSTRALIA
City of Burnside
City of Onkaparinga
City of Marion
Local Government Association of South Australia
Government of South Australia
SA Water
City of Salisbury
City of Playford
City of Mitcham
Murray Bridge
EPA South Australia
City of Port Adelaide Enfield
City of Tea Tree Gully
The City of Unley
City of Charles Sturt

Overview

1. What is water sensitive urban design
2. Natural water cycle versus urban water cycle
3. Land use change impact on:
   - stormwater runoff quality, ie pollution
   - stormwater runoff quantity, ie flood risk
   - urban heat island effect
4. WSUD solutions within City of Salisbury

What is water sensitive urban design?

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"The integration of urban planning with the management, protection and conservation of the urban water cycle that ensures that urban water management is sensitive to natural hydrological and ecological processes"

RESOURCE: Video (3:29)
Water sensitive urban design simply explained
http://www.watersensitivesa.com/water-sensitive-urban-design-wsud/

Guiding Principles of WSUD

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- Mimic the natural water cycle as close as possible
- Re-integrate water back into urban landscape, create microclimate
- Re-use of water at source (or close as possible)
- Protect receiving water quality (streams and marine)
- Fit for purpose water use
- Solutions at a range of scales to build resilience

Unions Street Dulwich, B-Pods (infiltration systems)

Sustainable

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More healthy natural ecosystems in urban environments

77% Stormwater contribution to total annual load of sediments to marine waters = 6,180 tonnes

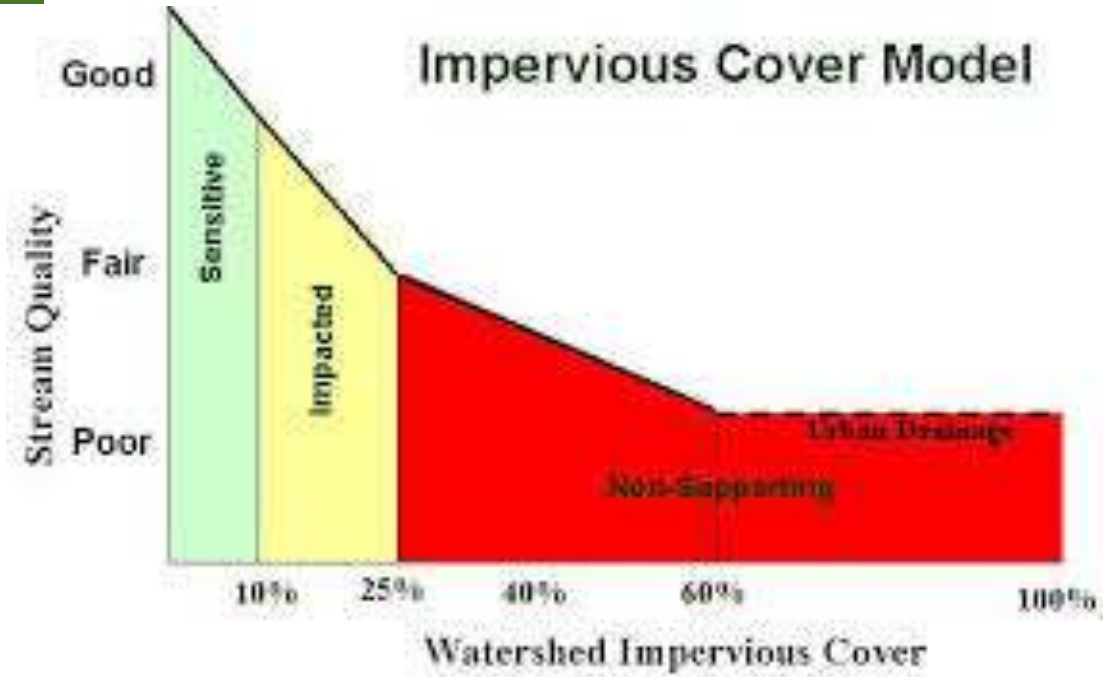
150t Stormwater contribution of nitrogen to the marine environment p.a.

Photo: S.Bryars

Sustainable

More healthy natural ecosystems in urban environments

10% Impervious cover at which stream health is impacted



Source: clear.uconn.edu. Centre for Land use education and research, Connecticut

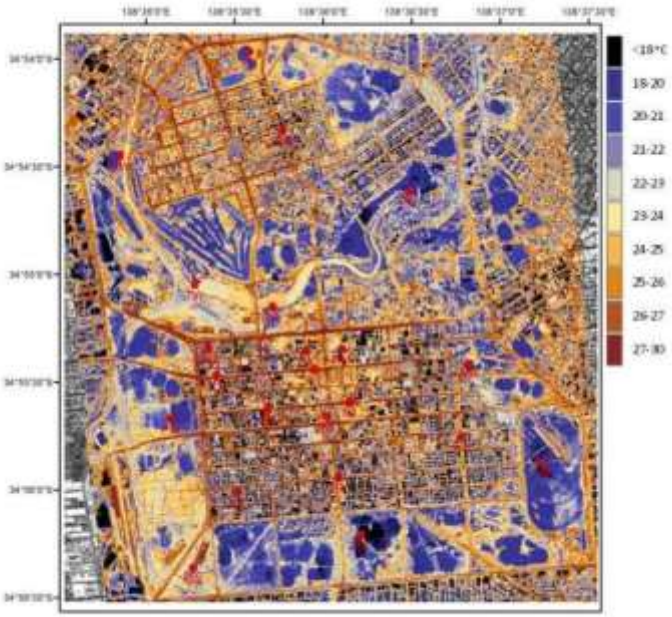
Liveable

Green & blue natural landscapes enhancing human health & wellbeing

1°C ↑ in daytime temp. ↑ can increase cooling demand in Adelaide's CBD by 1.5 million kWh per year = 1000 tonnes in $C0_2$ emissions

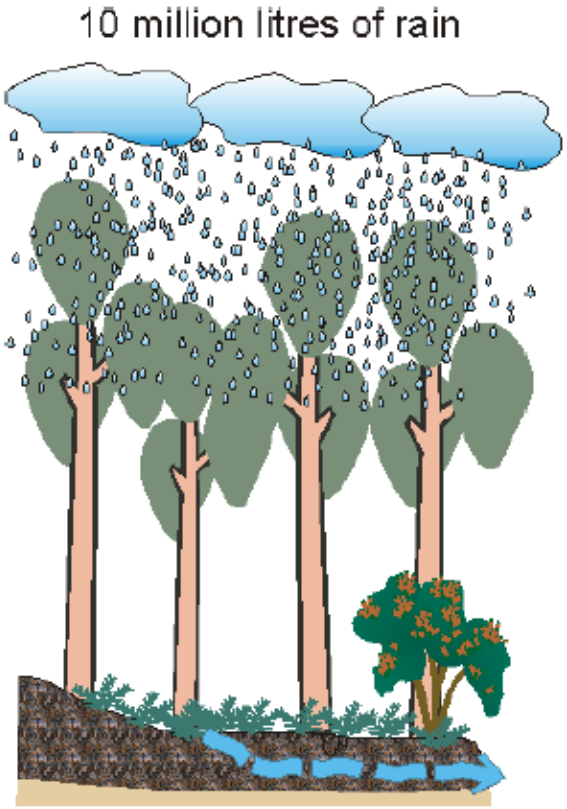
43°C threshold temperature for Adelaide above which mortality rates increase by 2- 10%

40% community less likely to be overweight living in greener neighbourhoods (European study)



Surface brightness temperature of the CBD & North Adelaide, early hours of 7 March 2011
Source: Flinders University

Natural water cycle versus urban water cycle

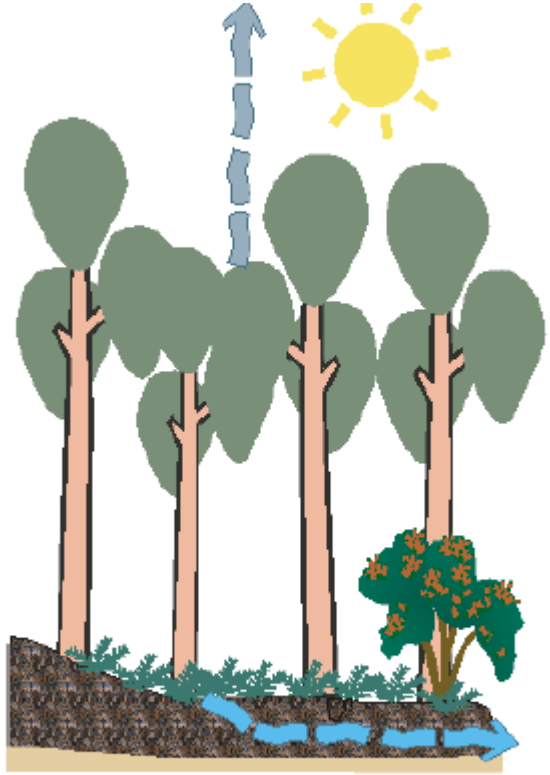


Water on a hectare of forest over a year

Source: CRC for Water Sensitive Cities

Natural water balance

85% lost to evapotranspiration

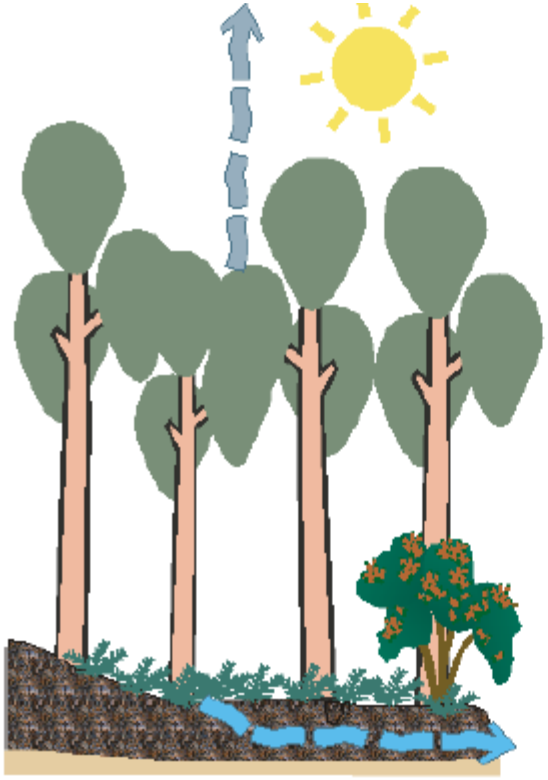


15% to stream filtered through soils (little or no direct runoff)

Source: CRC for Water Sensitive Cities

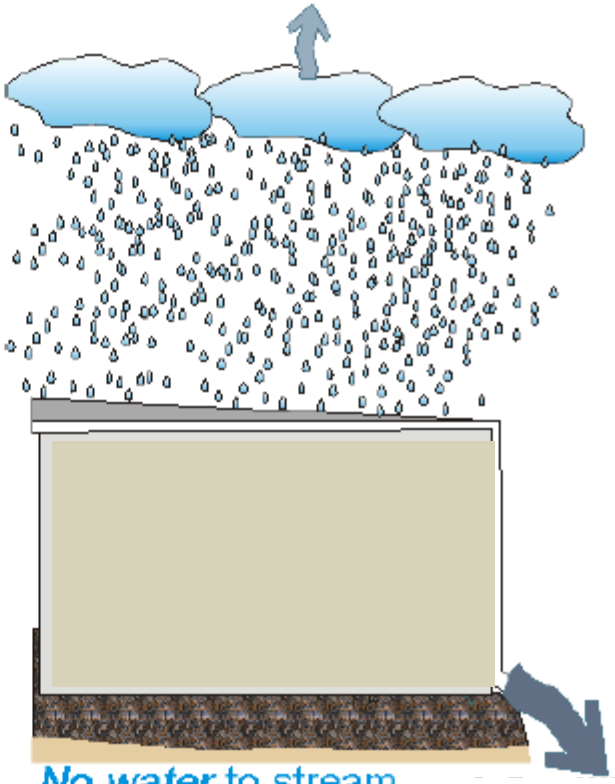
Replace forest with a building

85% lost to evapotranspiration



15% to stream filtered through soils (little or no direct runoff)

15% lost to evapotranspiration

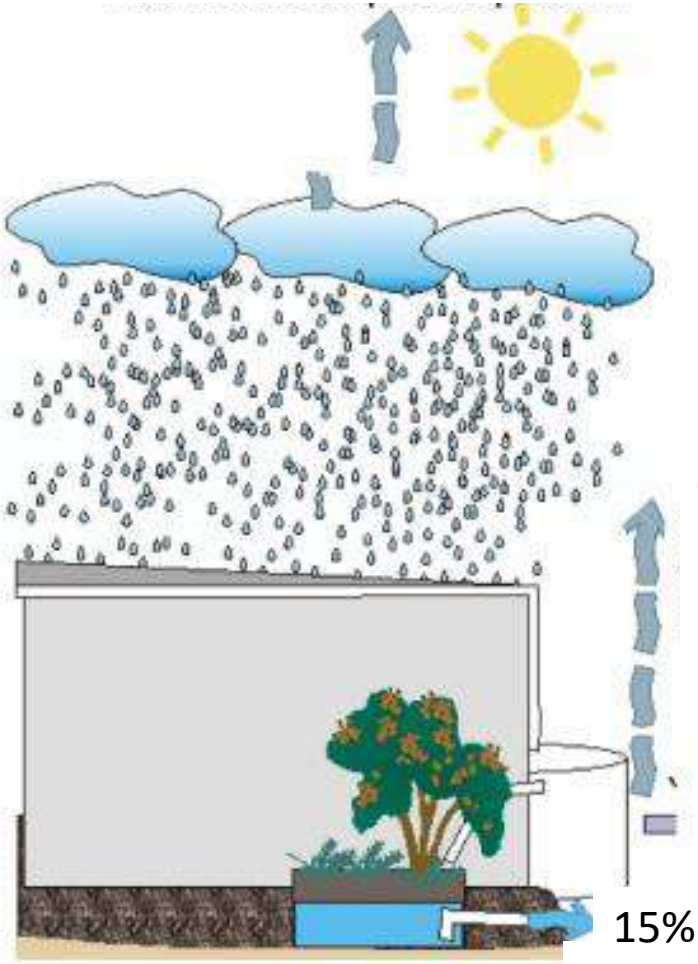


85% straight to stream (unfiltered) through stormwater pipes (all direct runoff)

Source: CRC for Water Sensitive Cities

Mimic natural flow regime

15% lost to evapotranspiration

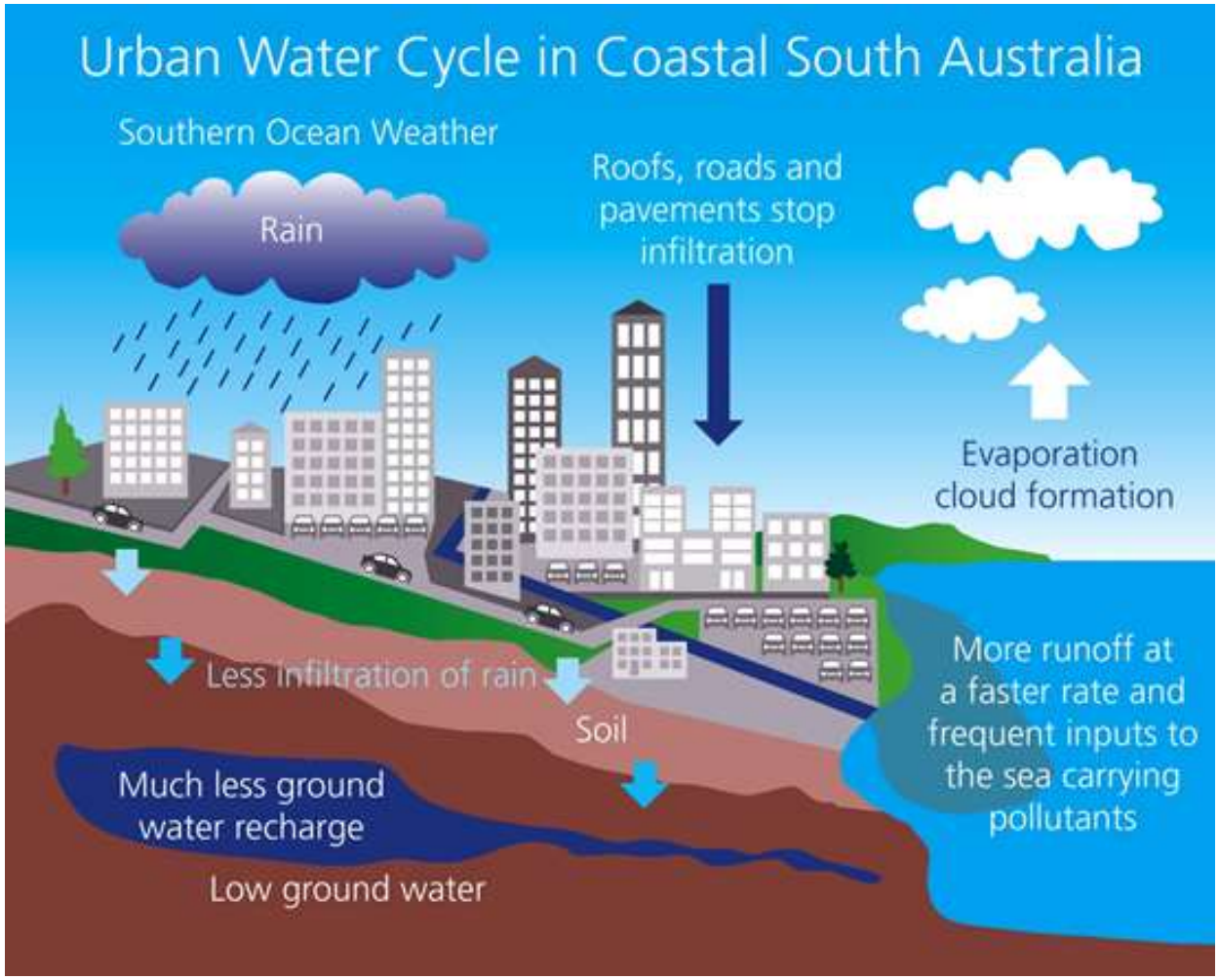


60% to be kept out of stream by harvesting

15% filtered through infiltration, biofiltration, irrigation etc and returned to streams to restore baseflow

Source: CRC for Water Sensitive Cities

Natural water cycle



Source: www.epa.sa.gov.au/files/7492_urban_water_cycle.jpg

Change to hydrograph pre and post development

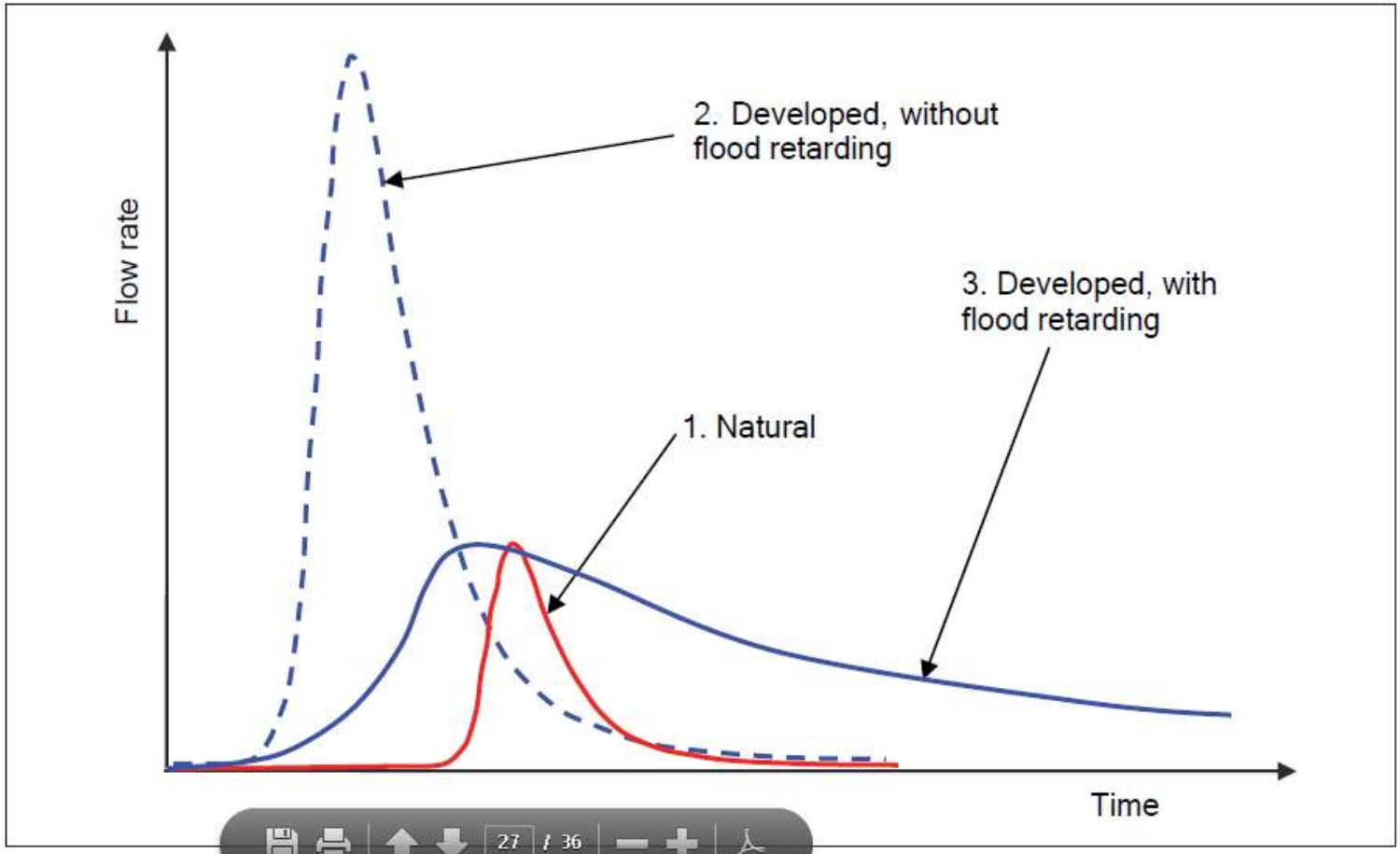


Figure 12 - Typical storm flow hydrographs before and after development

Change to hydrograph pre and post development

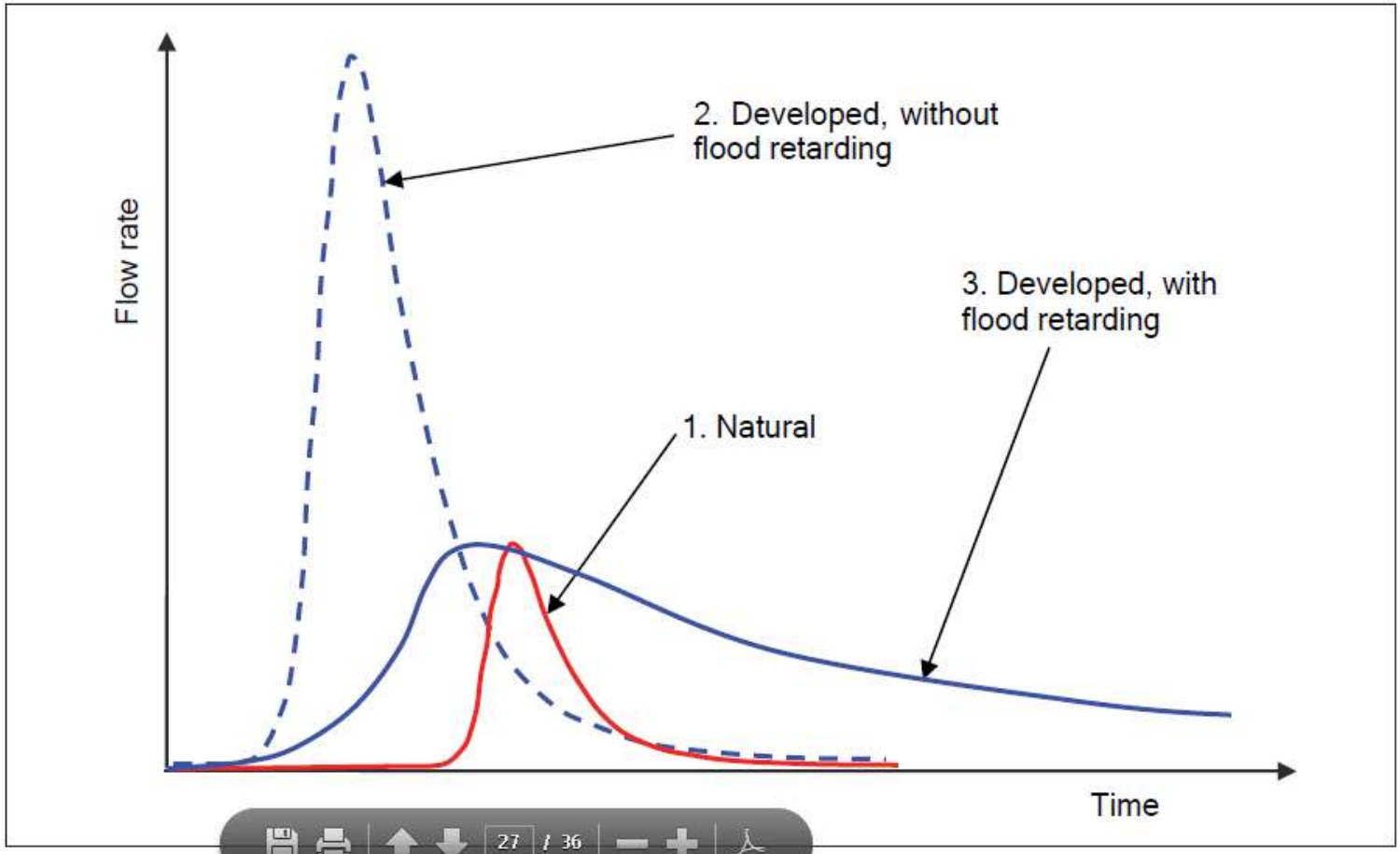


Figure 12 - Typical storm flow hydrographs before and after development

Stormwater management hierarchy

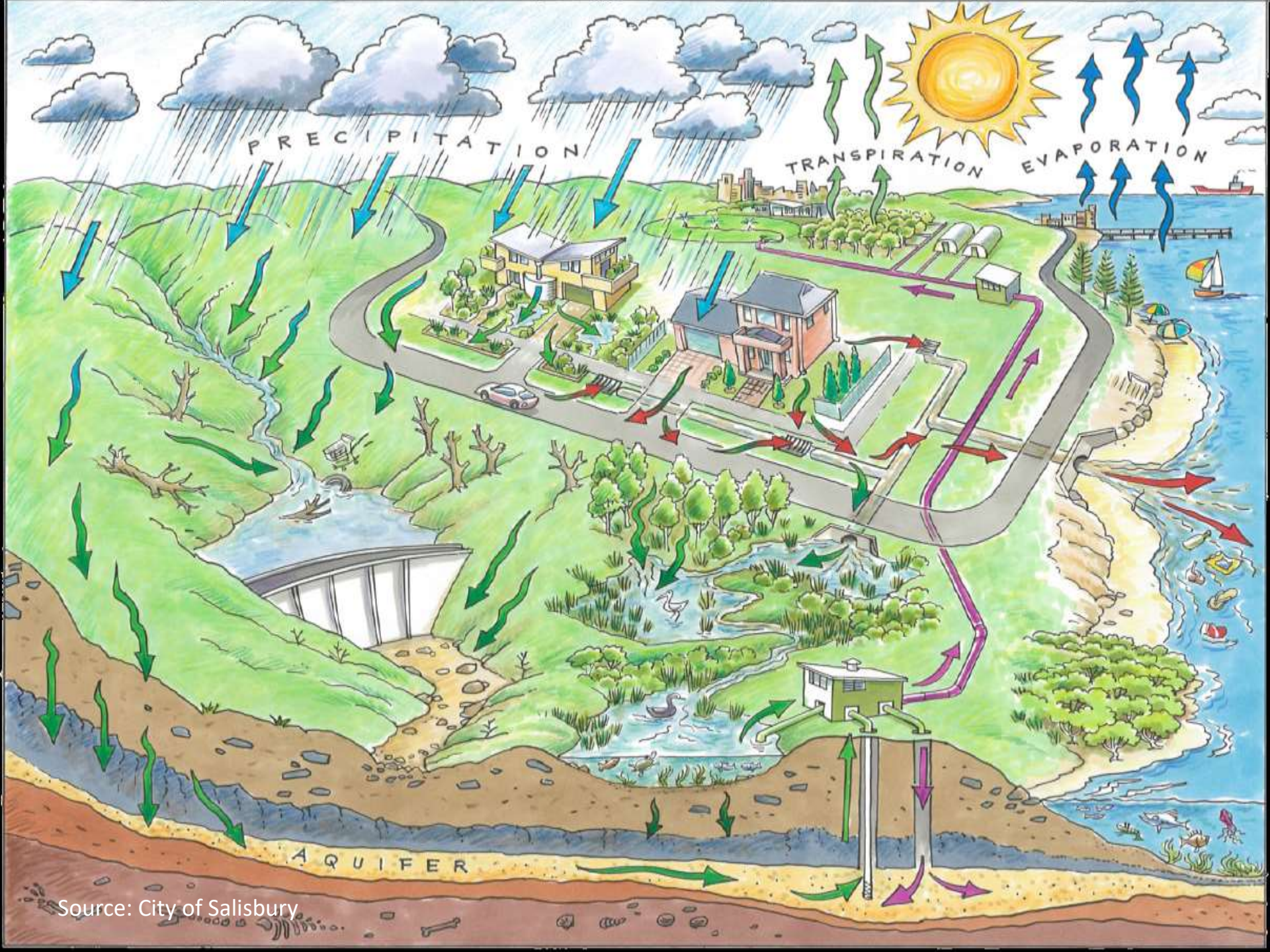
Volume reduction

Water Quality

Flow reduction

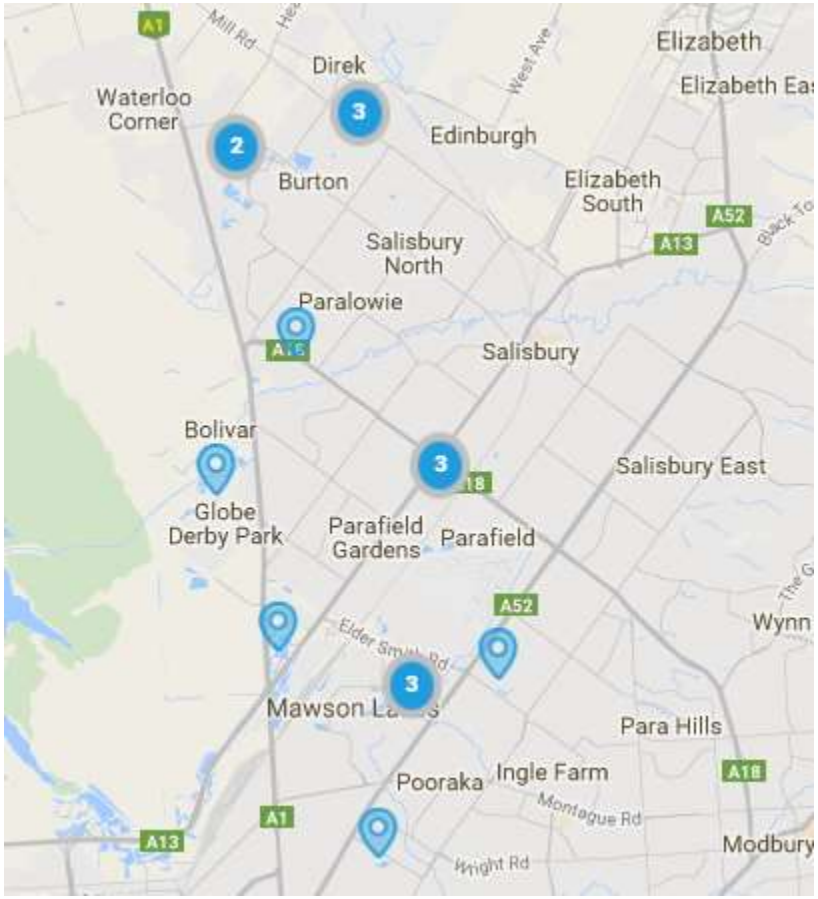
Conveyance

Source: Organica Engineering



Source: City of Salisbury

City of Salisbury WSUD Projects



WSUD Element Type

City of Salisbury

Function / Driver

Development Type

16 projects matching the current criteria.

Reset

This map has been developed with a database kindly provided by the **Goyder Instutute for Water Research**.

RESOURCE: Interactive map
http://www.watersensitivesa.com/wsud-projects/

Parafield Wetlands

Source: City of Salisbury

Parafield wetlands

Source: City of Salisbury

Parafield aquifer storage and recovery (ASR) scheme

Source: City of Salisbury

Unity Park biofilters, wetlands and ASR

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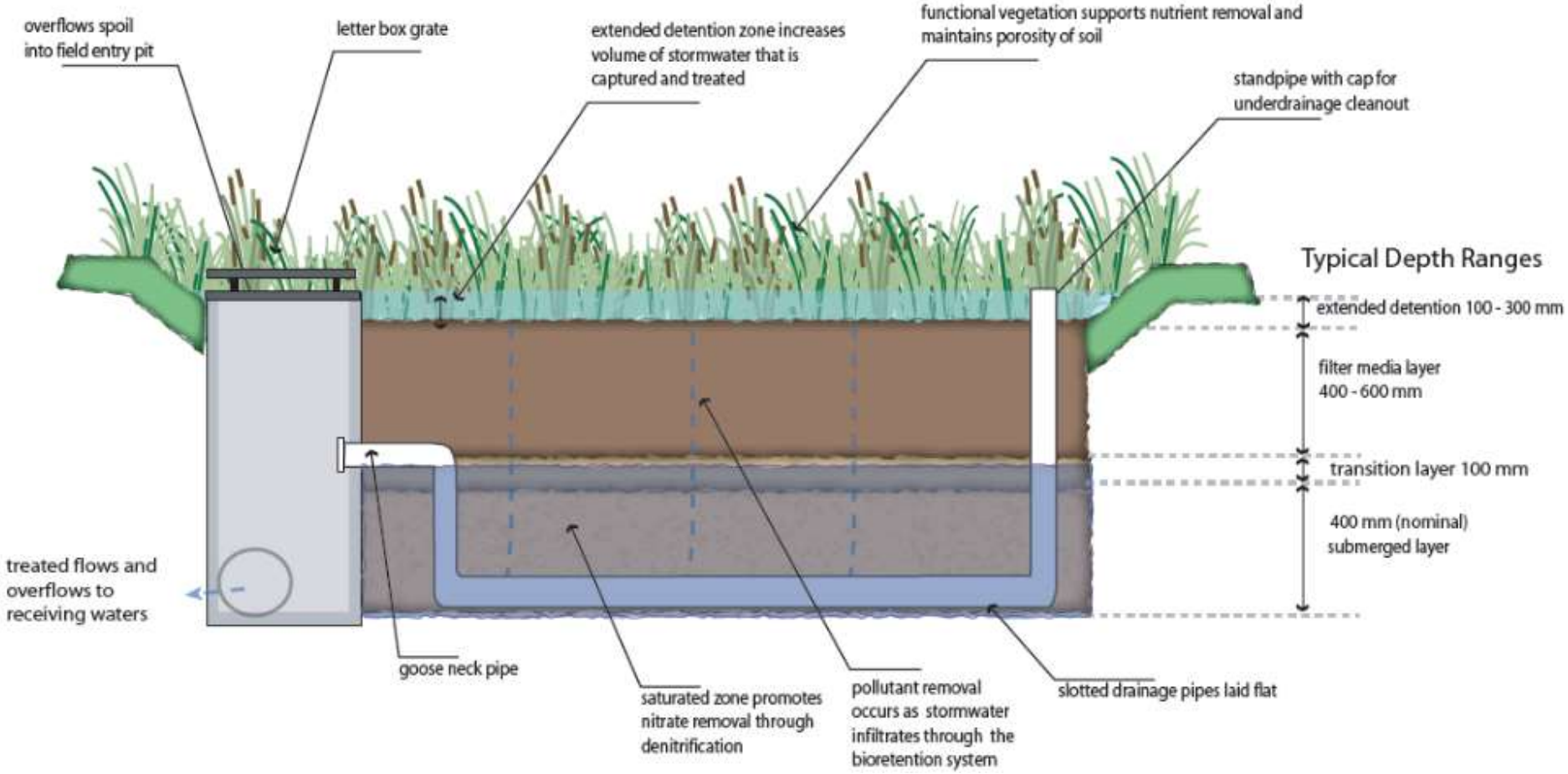
Source: Baden Myers

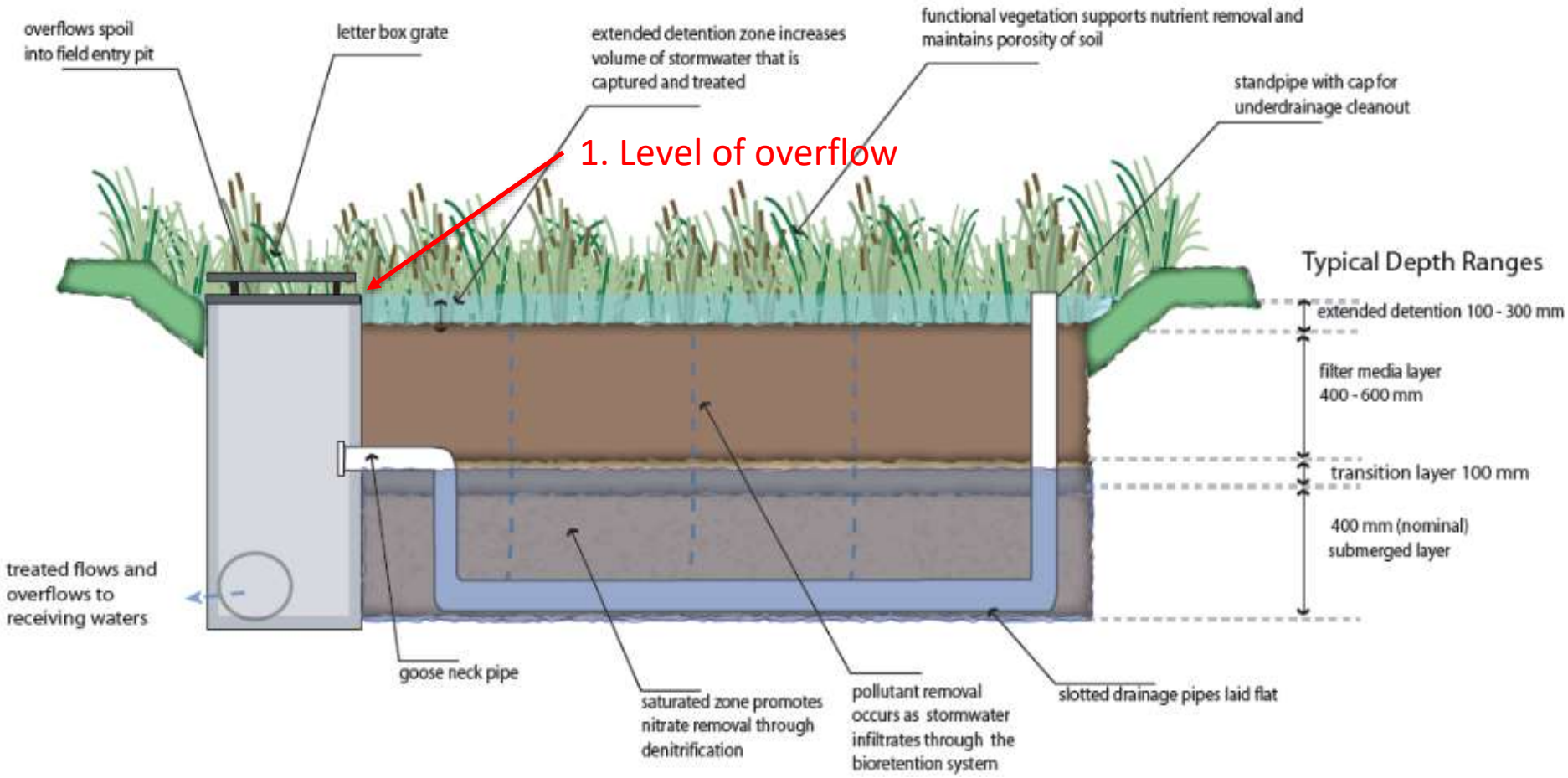
Source: Baden Myers

Biofilters - Overview



Source: DesignFlow, Adapted from Heathy Waterways

Biofilters - Overview



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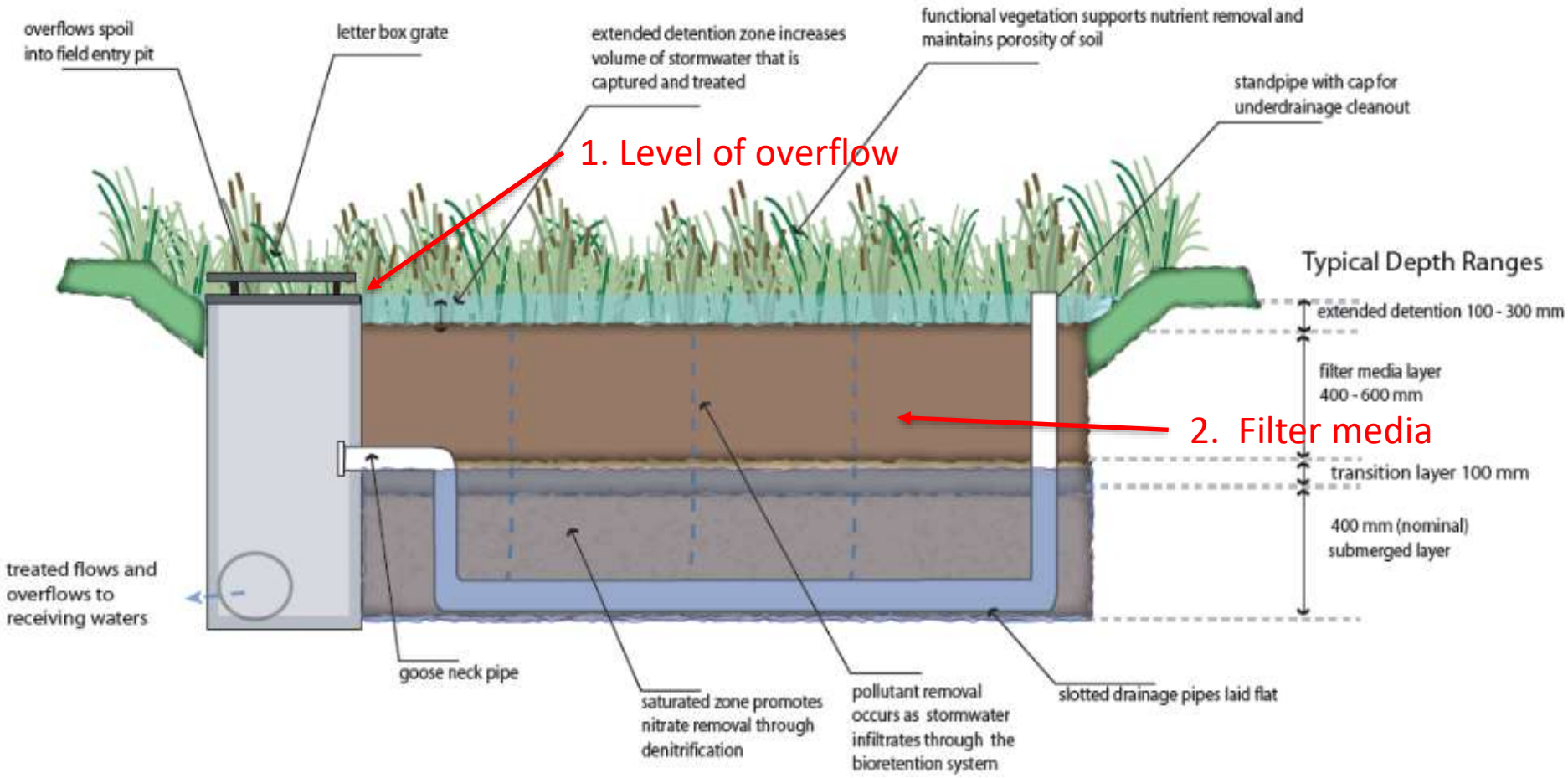

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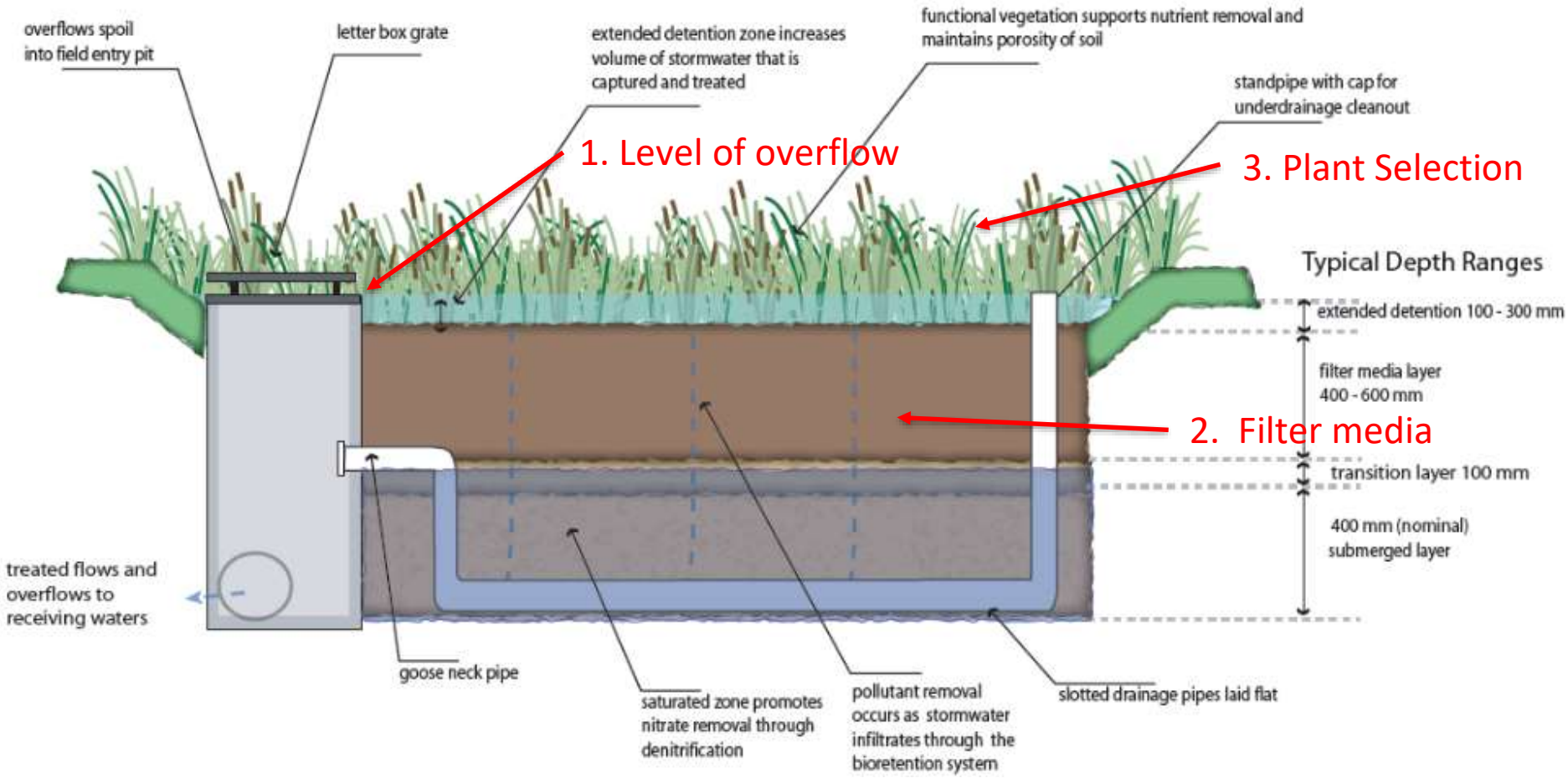

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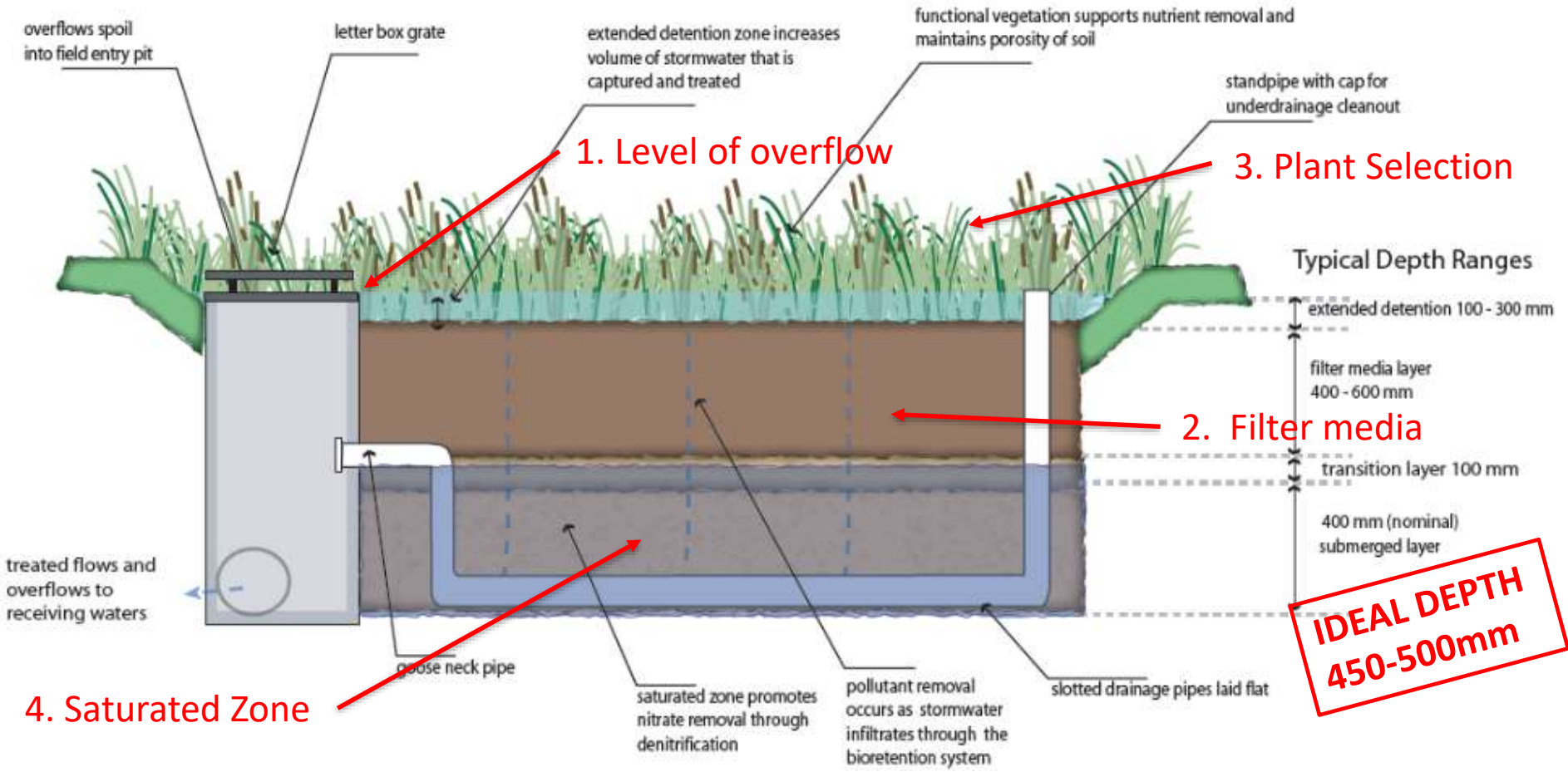


Source: DesignFlow, Adapted from Heathy Waterways

RESOURCES

Design Guideline - Adoption Guidelines for Stormwater Biofiltration Systems, CRC for Water Sensitive Cities
https://watersensitivecities.org.au/content/stormwater-biofilter-design/

Video - How to build a raingarden (8:56)
http://www.watersensitivesa.com/how-to-build-a-raingarden-in-your-backyard/

Guideline - A guide to raingarden plant species selection
Water Sensitive SA
http://www.watersensitivesa.com/wp-content/uploads/Raingarden-Plant-Fact-Sheet-v5_FINAL-Dec16.pdf

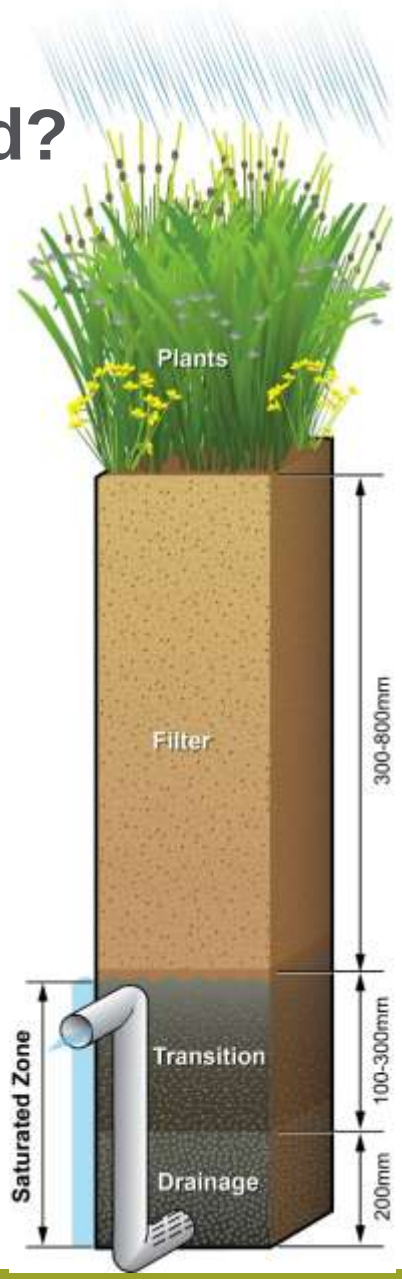
Funding – EPA Raingarden 500 Program
http://www.epa.sa.gov.au/environmental_info/water_quality/programs/rain-garden-500

How to construct a raingarden

Tips

1. If your raingarden is greater than 4m wide install two slotted drainage pipes (evenly spaced) and two overflow pipes

What do I need?



Saturated zone = transition + drainage layers must be lined with HDPE liner

Plants – See Water Sensitive SA *Guide to Raingarden plant selection and placement*

Filter media – Sandy loam - some clay (up to 3%) and organic matter (up to 5%) to retain moisture between rainfall events

Transition layer – washed sand

Drainage layer – 7 – 9mm aggregate

Shopping List

Home raingarden shopping list

- HPPE liner (preferred) or pond liner
- 2 x 90mm x 1m PVC pipe
- 50mm slotted agricultural pipe – to suit – minimum 3 metres for 1m2
- 2 x 90mm T junctions
- 4 x 90x75x60x50x40 stormwater PVC stepped adaptor (Holman)
- 4 x 50mm couplings (Vinidex)
- 2 x Elbow 90 degrees
- 1 x 90mm PVC collar and cap and screen (with mesh to keep mosquitos at bay)
- Plus pipework to connect to downpipe
- Duct tape
- 20 mm gravel (for area at 200mm depth)
- 4 - 7 mm screenings or pebbles (for area at 50 mm depth)
- Washed sand (for area at 100mm depth)
- Sandy loam (for area at 400m depth)

Tools
- Angle grinder
- Saw
- Stanley knife
- Pen
- PVC glue
- ruler

Plus a basic frame

How to size your raingarden

Area of run-off (m^2)	Area of raingarden (approx.) (m^2)
50	1
100	2
150	3
200	4
250	5
300	6
350	7
400	8
450	9

Stormwater greening our suburbs

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Lightsview infill development

Source map: www.lightsview.com.au

Permeable surfaces University of SA

Source: Baden Meyers

Benefits of WSUD

- Reduced pollutant loads – TN, TP and SS
- Watercourse stability
- Healthy waterways and marine environments – more opportunities for recreational use
- Flood mitigation
- Urban cooling
- Human health and wellbeing

Research questions

- How should we design our cities and towns to minimise the impact of changes in land use and imperviousness on community wellbeing and the environment?
- What technologies or design elements could we apply?
- How do infiltration rates differ across a range of soil types? What are the implications for the rate of stormwater runoff?

www.watersensitivesa.com

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