WATER SENSITIVE SA

# WSUD – in a future warmer climate

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Parks and Leisure Australia
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**Water Sensitive SA** - established to build the capacity of all organisations with a role in the planning, design, approval, construction or maintenance of new developments and infrastructure to implement best practice water sensitive urban design (WSUD)

# Water Sensitive SA Program Partners

WATER SENSITIVE SA

Natural Resources
Adelaide and Mt Lofty Ranges

LOCAL GOVERNMENT RESEARCH & DEVELOPMENT SCHEME

Government of South Australia
SA Water
City of Burnside
City of Port Adelaide Enfield
City of Onkaparinga
City of Salisbury
Stormwater South Australia
Local Government Association of South Australia
City of Tea Tree Gully
City of Charles Sturt
City of Playford
Australian Government | National Landcare Programme
EPA South Australia
Murray Bridge
City of Marion

# What we provide:

- WSUD policy development and implementation pathways
- specialist training
- networking opportunities and peer-to-peer
- more accessible WSUD research for practitioners
- guidelines and tools
- information sharing through our website, e-newsletter, blog articles and forums.

Angas Street, Adelaide adjacent SAPOL

# Overview

- Climate change impacts on stormwater yields
- Case studies,
  - City of Burnside B-Pods
  - City of Unley, Randolph Ave Streetscape Upgrade
- Research- building the case for WSUD

Oaklands Park Wetland, City of Marion
Photo: M. Mullan

# Climate change impacts on stormwater yields

For the Adelaide region the CSIRO predicts for 2050

- annual rainfall reduction by 2050 of between 5-10%
- an increase of 2-4% in potential evapotranspiration.

compared with 1980-1999.

Adelaide Zoo

# Implications of climate change & infill development on stormwater yields

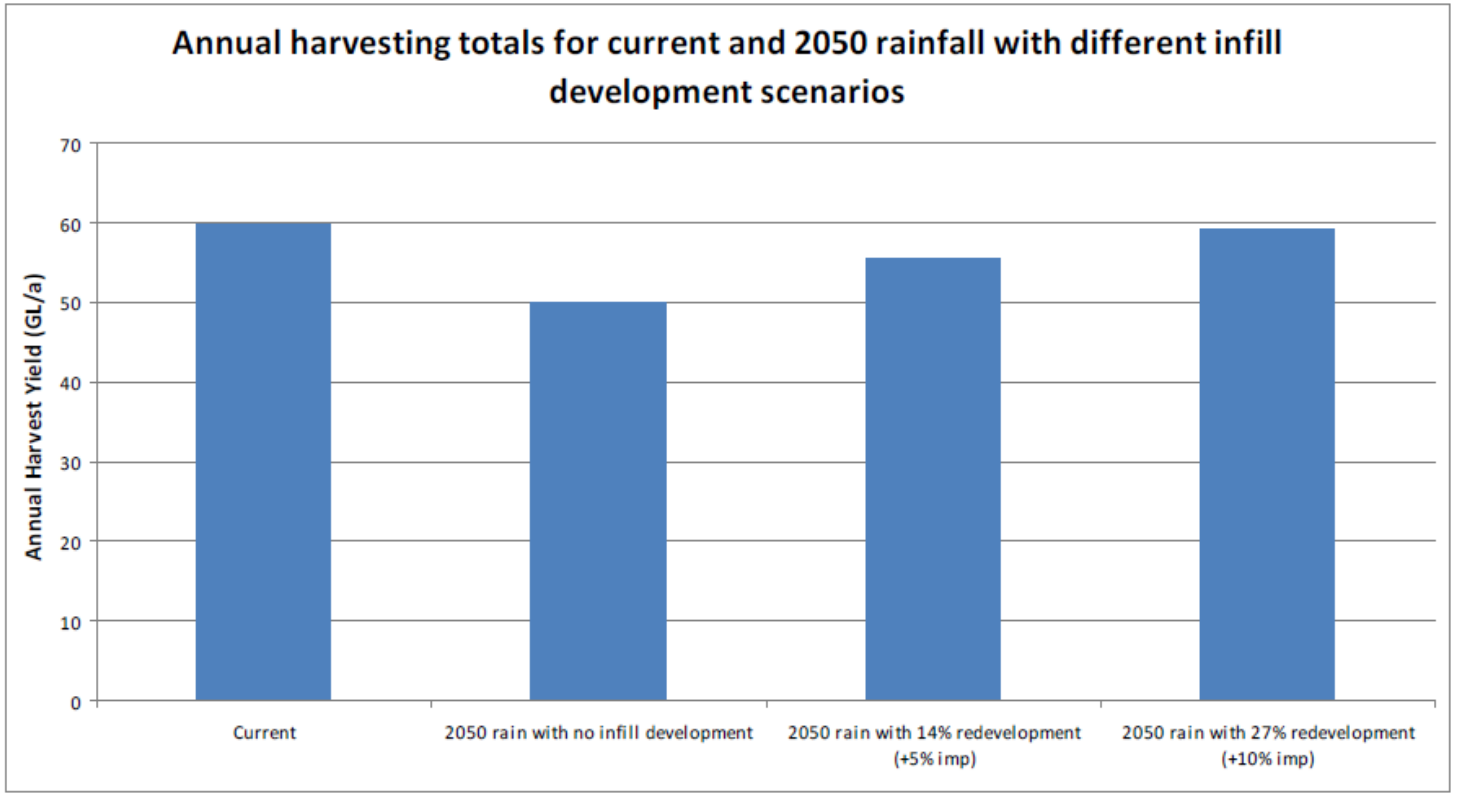


**Figure 7 Total yield for Greater Adelaide using climate change and urban consolidation scenario**

W&G Engineers (2009), Urban Stormwater Harvesting Options Study

Cities of Marion and Holdfast Bay can expect an increase in imperviousness from 65% in 2011 to 89% by 2040 (Jensen Planning + Design, 2011)

Notes

[1] 5 % increase in impervious area represents approx. 14% of existing properties being redeveloped.

[2] 10 % increase in impervious area represents approx. 28% of existing properties being redeveloped.

# WSUD Design Objectives

Development Plan Policy

- Water Conservation
- Stormwater quality - pollution reduction performance targets
- Stormwater quantity – rate and volume discharged = pre-development conditions

# Flood Management

capacity of the existing drainage system is not exceeded.

no increase in the 5 year ARI peak flow compared to existing conditions.

no increase in flood risk for the 100 year ARI peak flow, compared to existing conditions.

Old Port Road, Queenstown (SA) Source: City of Port Adelaide Enfield

Kirkcaldy Avenue, Grange Source: Baden Myers

# Stormwater Quality

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**45%**
retention of typical annual urban load of total nitrogen.

**60%**
retention of typical annual urban load of total phosphorus.

**80%**
retention of typical annual urban load of suspended solids.

Caltex, 734 Marion Rd, Marion Source: Baden Myers

Cooke Reserve, Royal Park. Source: City of Charles Sturt

# Ah ha moments…….

# Balance back into the urban water cycle

*"To reintegrate urban water into the landscape to facilitate a range of benefits including microclimate cooling, local habitat and provision of attractive spaces for community use and wellbeing".*

City of Port Phillip (Vic) Planning scheme. In policy 22.12 Stormwater Management (Water Sensitive Urban Design) you will find policy Objectives 22.12.2

# Open Space Solutions

# Designing for multiple benefits

Bowden Urban Village (SA) Source: Water Sensitive SA

Regents Park (NSW) Source: Blacktown City Council

# Streetscape Solutions

# Streetscale WSUD

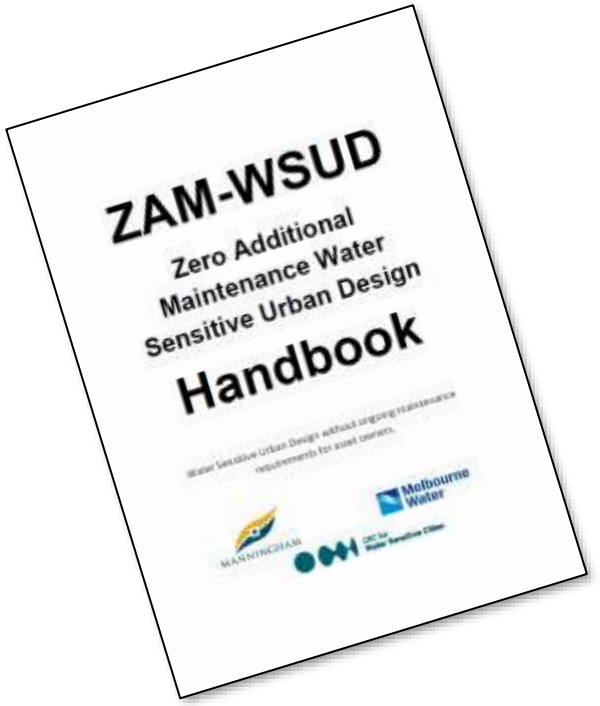
Stawell Street, Mentone (VIC) Source:M.Dobbie

Redfern, NSW Source: M.Dobbie

Lochiel Park, (SA)

Jellicoe Street, Auckland (NZ) Source: DesignFlow

# Zero Additional Maintenance WSUD Handbook

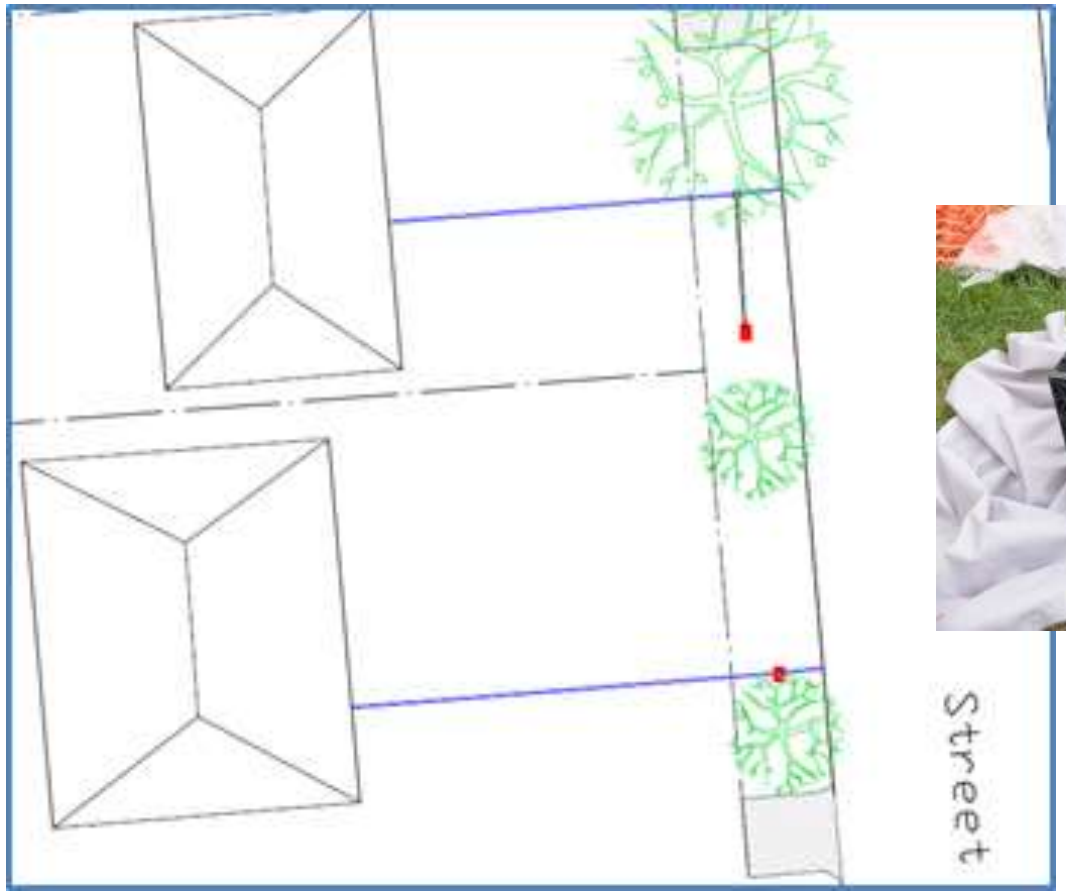



Park Avenue, Doncaster, single barrier kerb installation Source: CRC for Water Sensitive Cities

Preliminary field trials undertaken at the Manningham depot in 2014/15 confirmed the suitability of the **Soft leaf buffalo grass** (Palmetto SS100 cultivar)

www.watersensitivecities.org.au

# Burnside B-Pods – infiltration systems




# Performance Estimates

**Development type**

- Urban streetscape

**WSUD feature type(s)**

- Passive infiltration via subsurface stormwater retention cells

**No. of WSUD features**

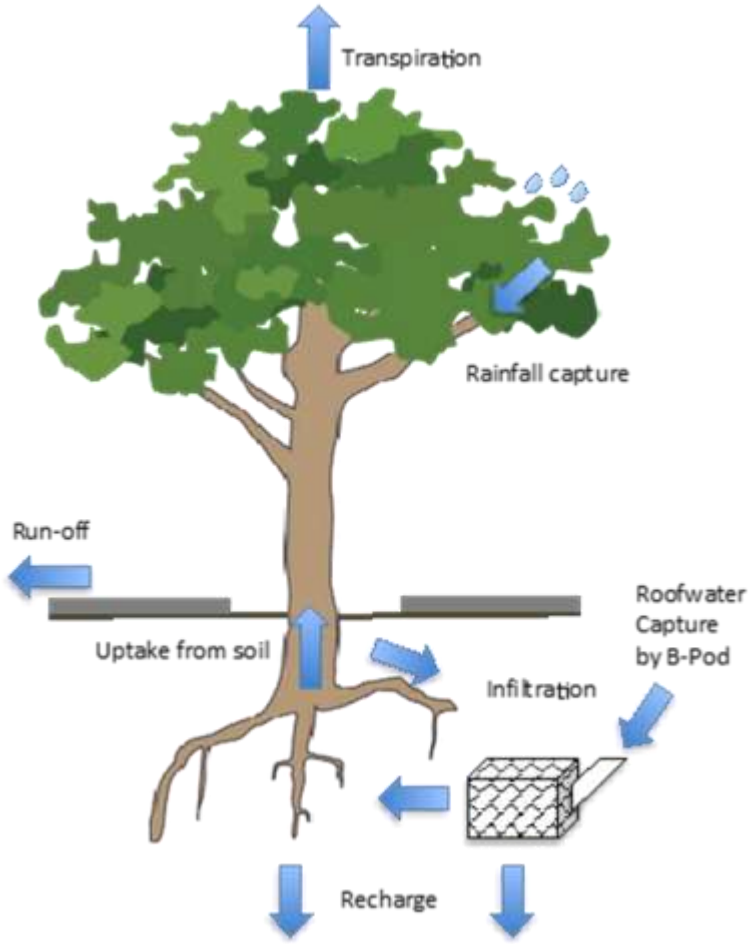
- More than 200 since 2013

**Total volume of stormwater storage**

- Capture of 1.77 ML of stormwater runoff p.a. based on 200 B-Pods capturing 108L on 82 rain days = 8,856L/B-Pod/year

**Stormwater peak reduction (Goyder Institute for Water Research modelling)**

- 1%



# B-Pods locations

Union Street, Dulwich

Union Street, Dulwich

Laurel Ave, Linden Park

# Research gaps

- Any impacts on road infrastructure associated with infiltration
- Tree health benefits – a control needed of trees planted without infiltration systems


Brigalow Avenue, Kensington Gardens  Source: City of Burnside

# EPA, Catchment to Coast Program
# Raingarden 500 – Demonstration Projects

- Randolph Avenue Fullarton, City of Unley
- Gilbert and Russell Streets, City of Adelaide
- Brooker Terrace (and others), City of West Torrens

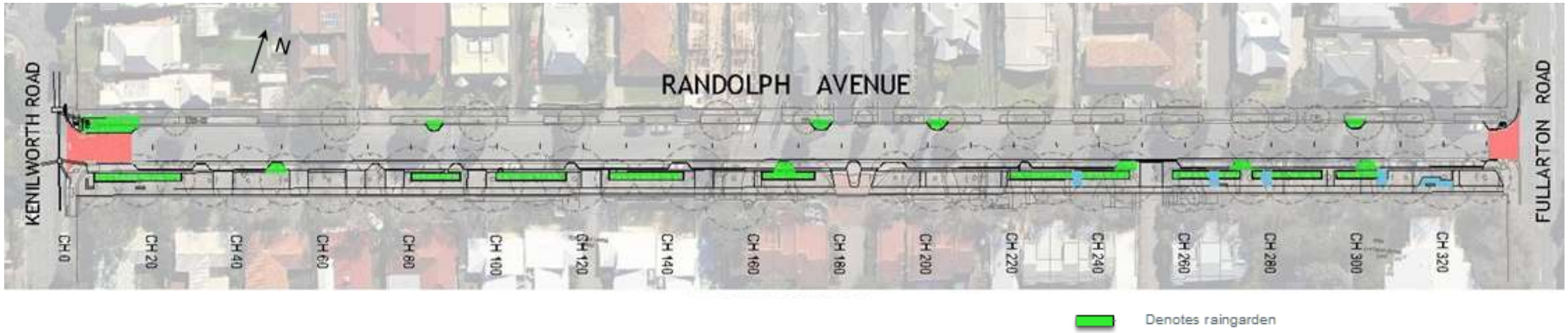
Brooker Terrace, City of West Torrens

Gilbert Street, City of Adelaide

# Randolph Ave, Streetscape Upgrade
# City of Unley


Randolph Avenue Parkside, Prior to construction  Source: City of Unley and Southfront

# Randolph Ave, Streetscape Upgrade
# City of Unley



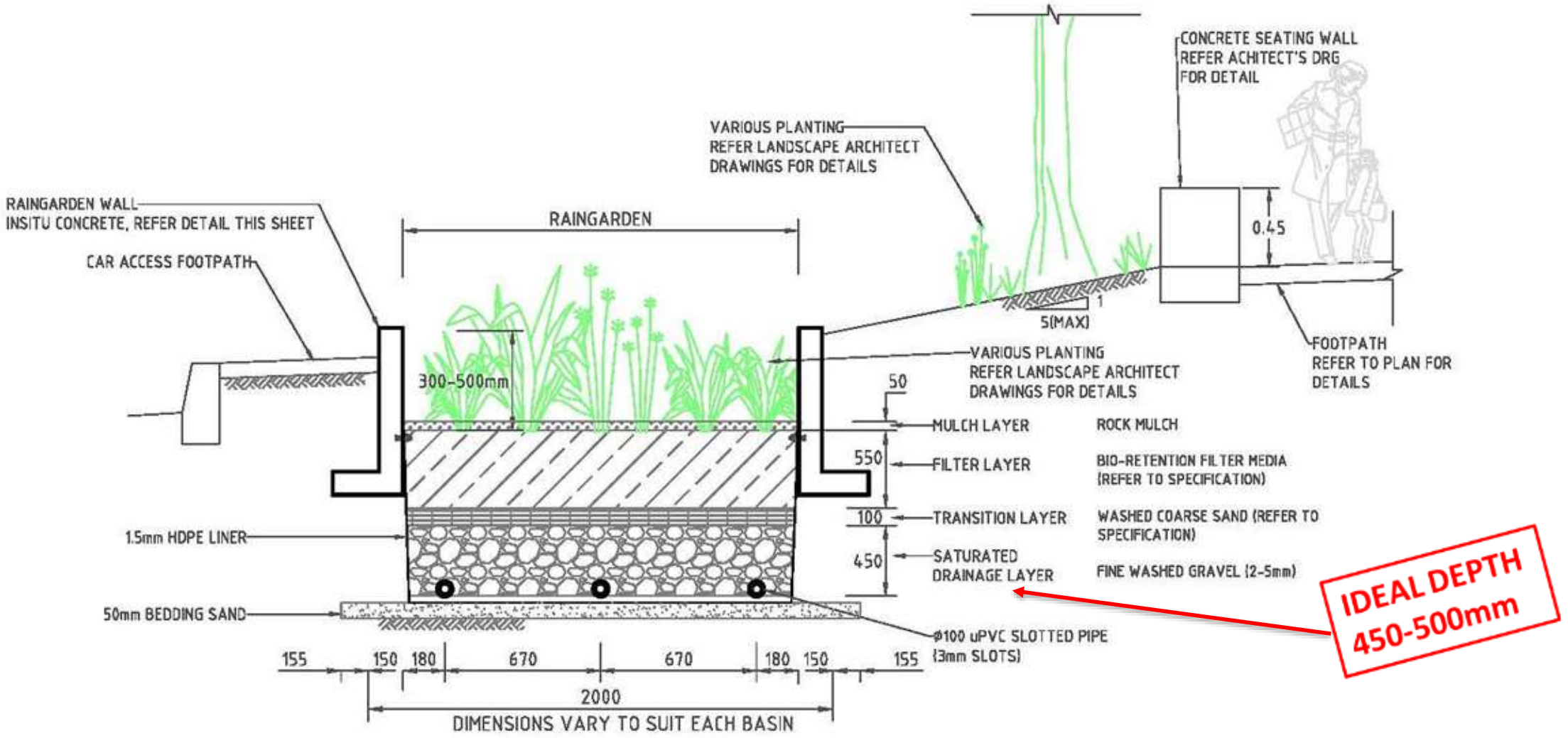

Bioretention – raingardens

- 10 raingardens of dimensions 1.70-2.10m wide x 6.75-25.5m long)
- Total area 245m2 (0.5% of impervious contributing catchment)
- A saturated zone of 450mm depth to assist plant viability and storage capacity
- A design infiltration rate of 160mm/hr through filter media
- HDPE lined system with no exfiltration

Stormwater infiltration wells

- 31 infiltration wells of dimensions 600x400x450 mm deep
- Waterproof membrane top and bottom with geofrabric and 20mm screenings around the perimeter, providing lateral infiltration to adjacent trees and garden beds.

# Typical Raingarden Cross Section



# Randolph Ave, Fullarton

July 2015

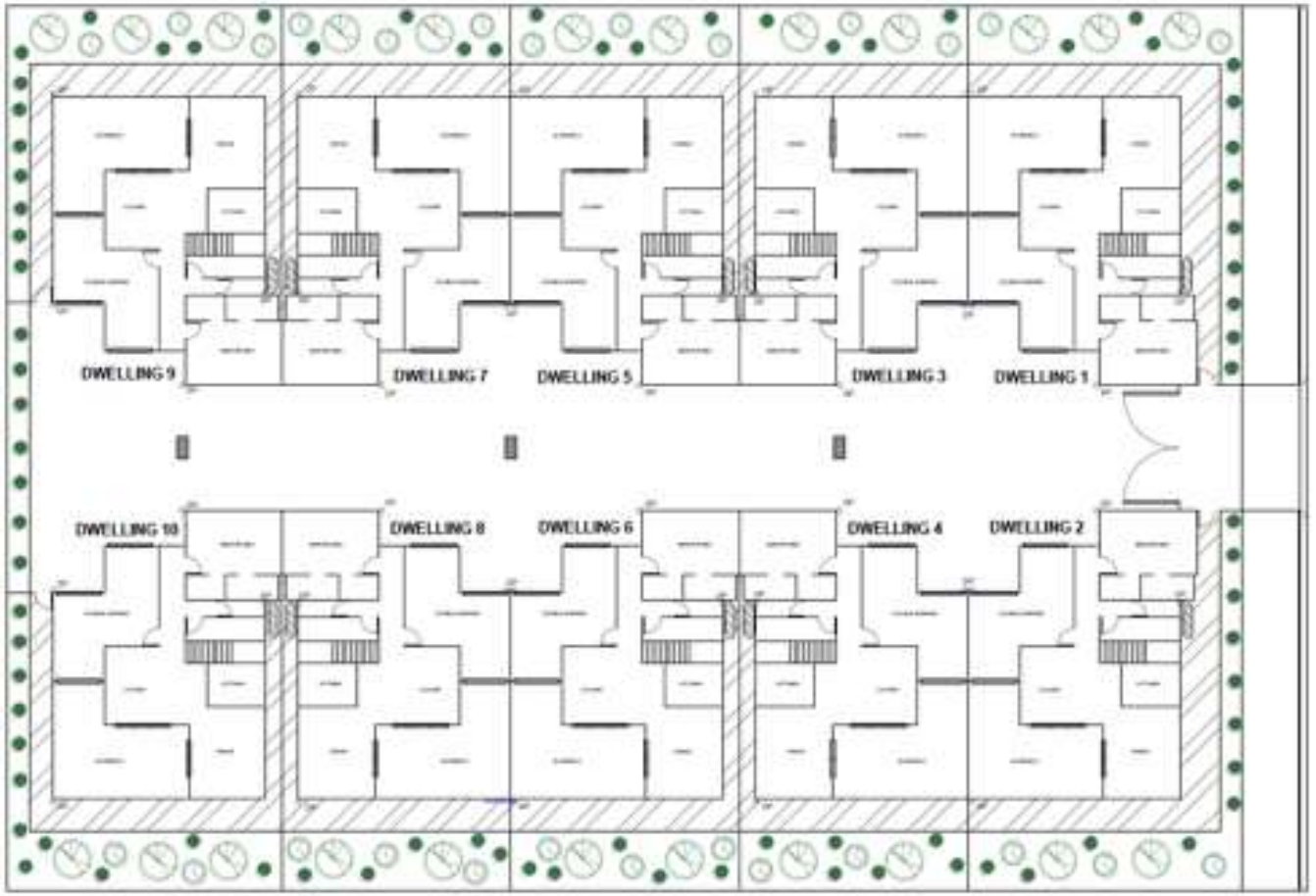
January 2016

# Building the case for WSUD and Green Infrastructure

1. Cost-Benefit analysis tool for green infrastructure and WSUD
2. Infill development scenarios that meet  WSUD performance targets and thermal comfort outcomes

# On-site solutions

# Infill development scenarios for WSUD performance and thermal comfort




1. The effectiveness of potential WSUD solutions to:
   - improve stormwater runoff quality
   - manage runoff quantity

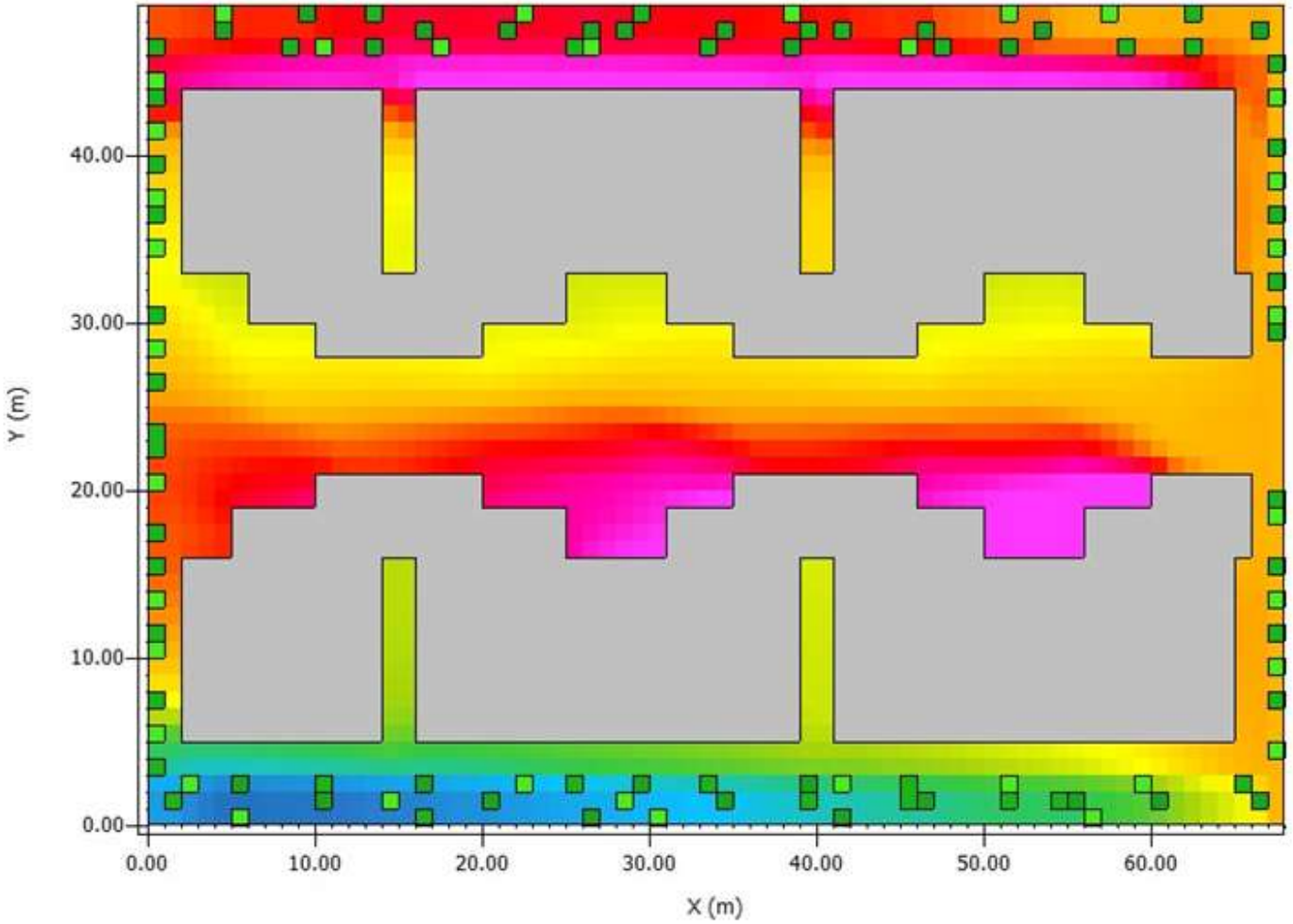
2. An assessment of ambient temperatures as a result of the urban heat island.

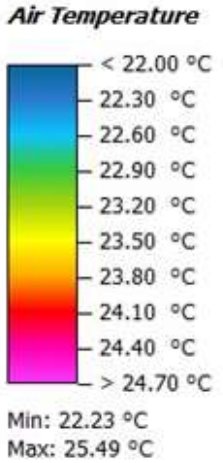
# Infill development scenarios for WSUD performance and thermal comfort

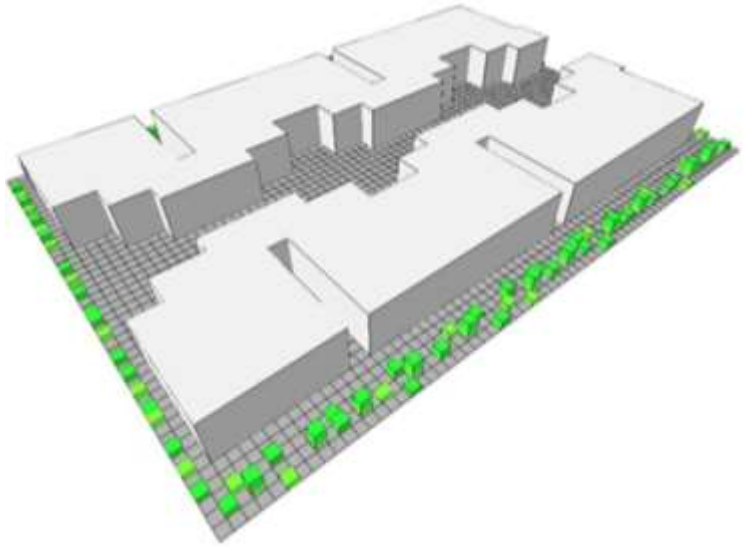
Scenarios to be assessed will include

- ↓ dwelling footprint to provide increased private open space
- ↑ driveway width and add central driveway raingarden and trees
- Underground stormwater storage (retention for re-use)
- Above ground stormwater storage (up-sizing of rainwater tanks, 2,000L, 3,000L and 5,000L)
- Permeable pavers versus concrete driveways
- Onsite detention
- Green roofs

# ENVI-MET – Atmospheric Temperature Base Case



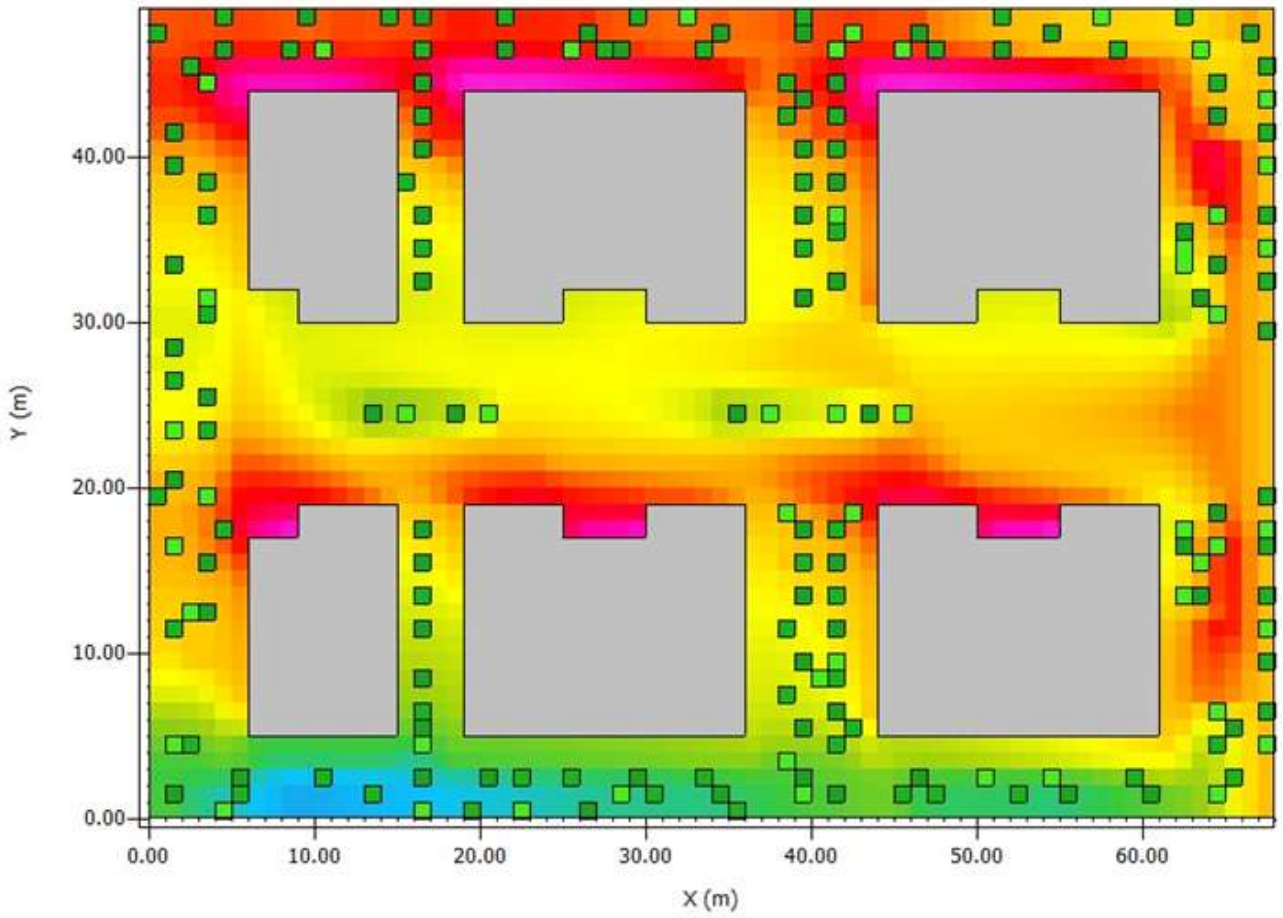



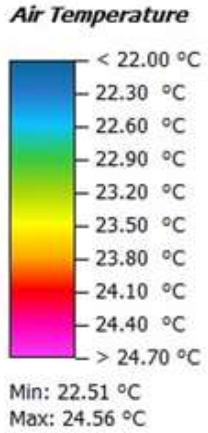



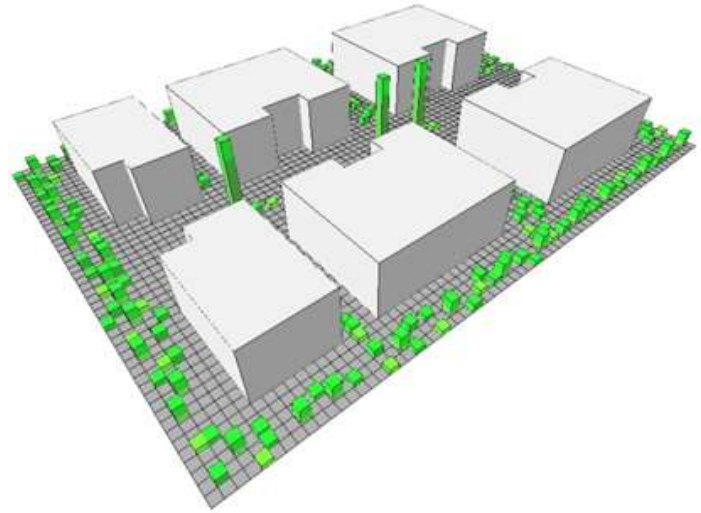
Base Case

- 65% impervious
- 13% pervious pavement
- 22% green space

# ENVI-MET – Atmospheric Temperature
# S1 - Reduced foot print plus central raingarden



Scenario 1

- 36% impervious
- 36% pervious pavement
- 29% green space

# Upcoming Training

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## Training & **Events**

**25 FEB 16** — **Detailed design of constructed stormwater treatment wetlands**
25 FEBRUARY - 9:00am to 4:30pm

**21 MAR 16** — **Leadership across boundaries to advance water sensitive urban design**
21 MARCH - 8:30am to 22 MARCH - 5:00pm

**25 MAY 16** — **Construction of WSUD assets**
25 MAY - 9:00am to 4:30pm

**26 MAY 16** — **Maintenance of WSUD assets**
26 MAY - 9:00am to 4:30pm

Greenfields Wetlands Source: City of Salisbury

www.watersensitivesa.com

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