Case Study 4

Bio-filter Swale at Bulkana Oval

WATER SENSITIVE URBAN DESIGN SYSTEM
- Bio-filter swale

LOCATION
- Banksia Park, Tea Tree Gully

AVERAGE ANNUAL RAINFALL
- 450 mm (Parafield, 100-year average)

YEAR ESTABLISHED
- 2009

RESPONSIBLE AUTHORITY
- City of Tea Tree Gully

Case study prepared by the City of Tea Tree Gully, Parks Assets Department, February 2010

Source: Department of Planning and Local Government

Background

This is one of several case studies providing examples of bioretention and swale systems that have been incorporated into landscaping in public spaces.

Project objectives

The project aims to:

- construct a bio-filter system to effectively store and re-use site run-off from two nearby ovals with sub-surface drainage systems
- act as a demonstration project showing a bio-filter system in a popular open space area
- be easy to maintain as the area receives consistent run-off from the sub-surface drainage system
- ensure community access in and around the swale as the area has high use and includes an athletics area adjacent to the swale.

Project description

This pilot project involved the construction and landscaping of a bio-filter swale for immediate storage and re-use of site run-off. The run-off is captured from summertime irrigation of the ovals and overland flows from rainfall events. The captured water is filtered through the vegetated swale, stored in the underground tank and used to irrigate the ovals.

The site is relatively steep so the water is slowed down as it runs through the pipe by a series of vegetated pre-filter drop structures. It then percolates into a low-flow underground pipe connected to an underground storage tank.

The project also called for easy maintenance and a high-quality visual aesthetic.

Lessons learned

Timing—Because it's difficult to control peak flows in the swale, even in summer, plants need to be well-established in spring or summer to ensure maximum growth and stability in the swale.

Community support—Swales gain community support when the project is well-maintained and designed, has extensive and aesthetically pleasing vegetation, and balances amenity considerations with water quality improvement.

Signage—On-site signage identifying WSUD infrastructure increases public awareness of this type of project and helps ensure that the infrastructure is appropriately maintained over the long-term. Signage can also reduce the risk of other projects being undertaken near the site that could disturb the swale (for example, through weed spread or topsoil movement) or undermine the swale's effectiveness.

Soil specifications

The soil includes an engineered drainage medium of fine and course sands in the intake/filter area of the system and an imported inorganic loam in the upper (flow-restriction/pre-filter) areas of the swale. Pebble mulch is used in combination with jute mat; it is important that the pebbles can lock together to avoid moving downstream.

Maintenance suggestions

- Maintenance involves predominantly weed management, re-pegging of the jute mat and targeted top-up watering in extreme conditions, which is especially important during the first summer of the project.
- Litter and debris is an issue where there are no trash racks in the catchment and the site is a busy recreation area.
- Part of the swale system was kept open to allow slashing of vegetation in winter and spring to simplify maintenance.

Species used in the swale and pre-filter areas
(see landscape design plan)

Scientific name	Common name	Observations in February 2010
Dianella revoluta	Little Rev	Planted spring 2009 (April) • The plants are growing well on the edges of the swale.
Juncus krausii	Matting Rush	Planted spring 2009 (April) • Some individuals are showing signs of water stress.
Lomandra longifolia	Iron Grass	Planted spring 2009 (April) • The plants are establishing well in the swale.

Species used on the intake/filter areas
(see landscape design plan)

Scientific name	Common name	Observations in February 2010
Cyperus vaginatis	Common Rush	Planted spring 2009 (April) • The plants are growing very well in the swale and becoming a dominant species on the site.
Juncus pallidus	Mat Reed	Planted spring 2009 (April) • The plants are successful only in the pipe outfall areas.
Isolepis nodosa	Knobby Club-rush	Planted spring 2009 (April) • Some individuals in the swale located near big Eucalyptus trees are showing signs of water stress. The large trees may be sucking the moisture from the plants. For this reason, it is important to undertake a tree survey before implementing this type of project.

Planting–related lessons learned

Overall—A good design process and the visual quality of the final product are critical in a highly urbanised area.

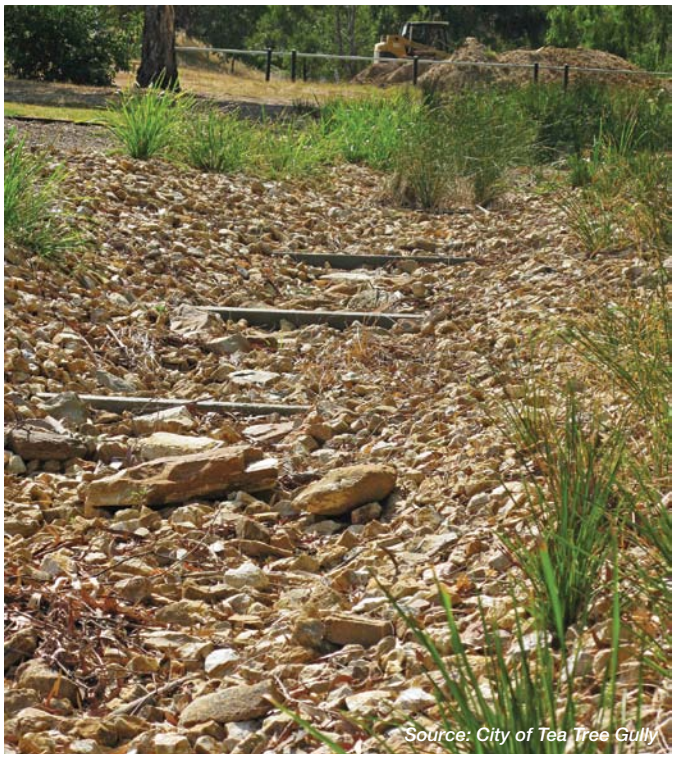
Maintenance—Clear guidelines need to be made upfront regarding management and monitoring issues in order to guide designers in developing a successful product. Contractors/staff who understand and can adjust to the specifics of the site are needed to achieve the best design of the swale. At least two years of dedicated/funded maintenance in the early development stages of the swale will assist weed control and the overall success of the swale.

Plant densities—Plants need to be grouped in compact areas and the terrain needs to reflect each species' horticultural needs.

Tree surveys—Tree surveys are useful to identify areas where large trees can draw moisture away from plants.

Water availability—As water can be very transient in swales, plant selection needs to take into account overly wet and overly dry periods.

Cyperus vaginatis growing well in the swale

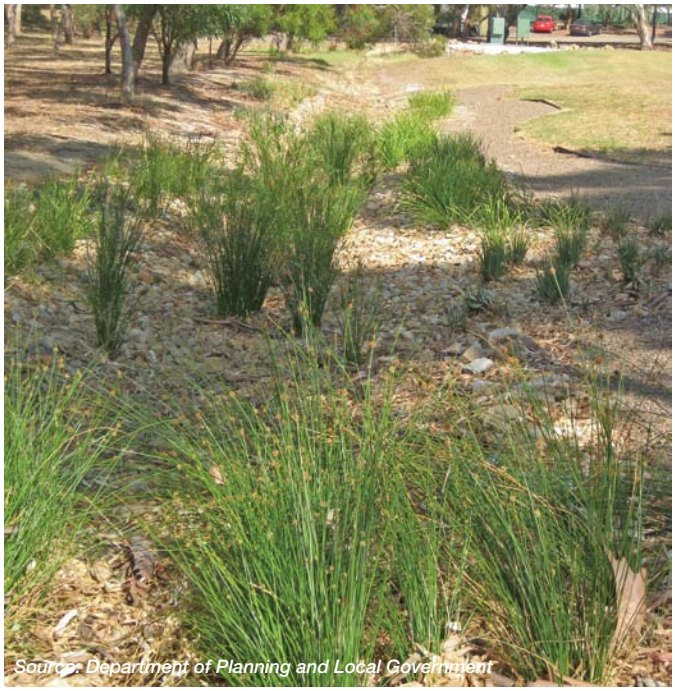


The bio-filter with nearby construction which can reduce the effectiveness of the swale

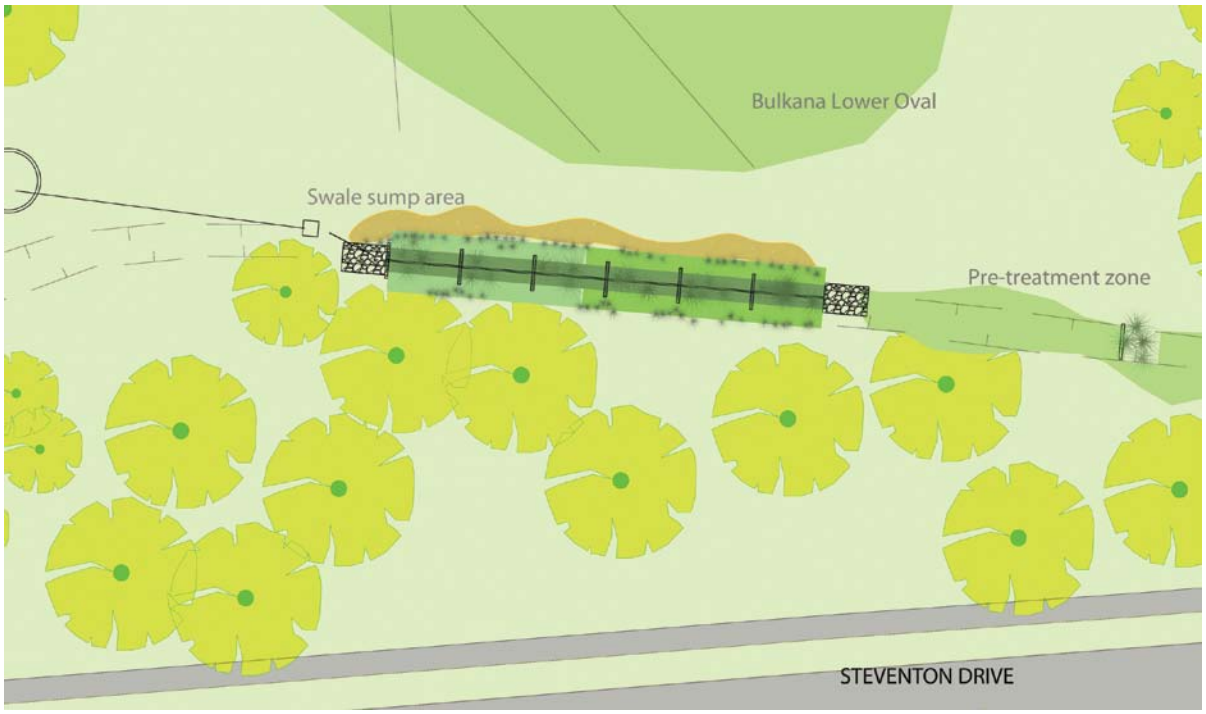
Dianella revoluta growing well on the edges of the swale and Lomandra longifolia well established in the swale.

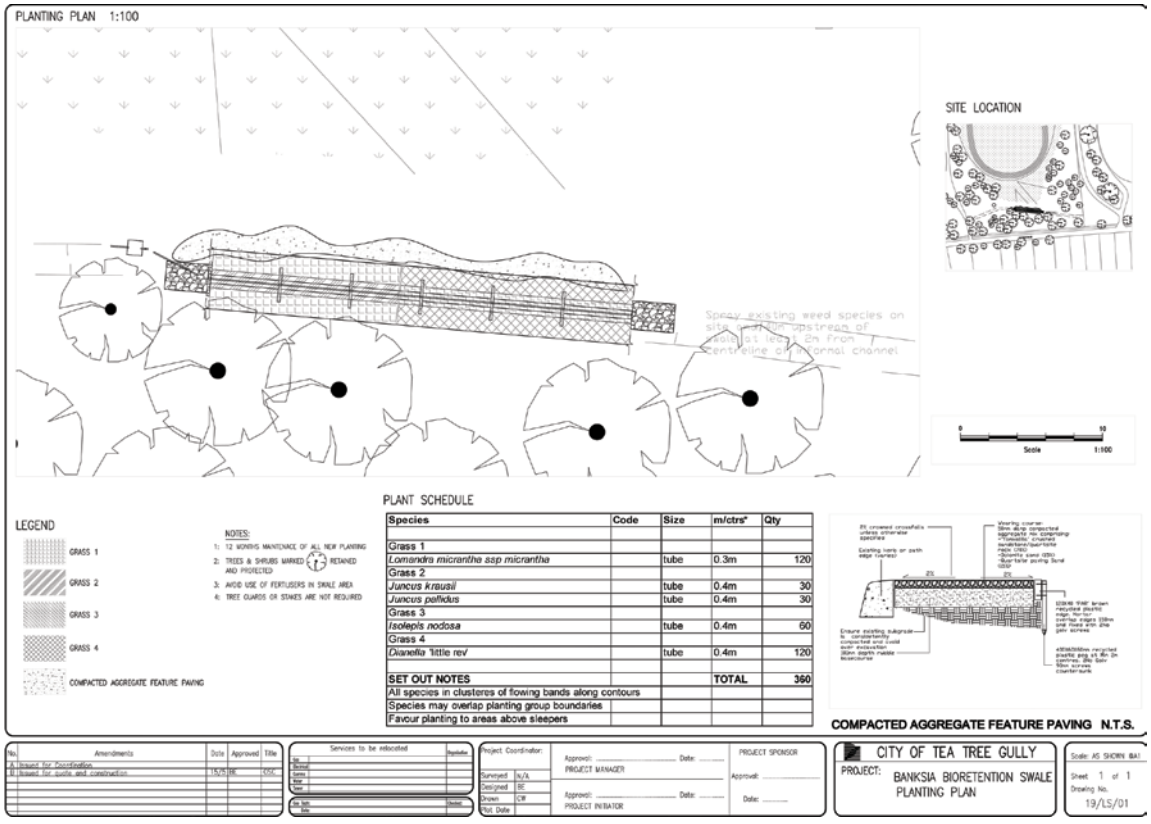
Captured water is stored in the underground tank and used to irrigate the ovals

The project site in relation to the oval



The project site in relation to the underground storage tank (background)


Bulkana Lower Oval
Swale sump area
Pre-treatment zone
STEVENTON DRIVE


PLANTING PLAN 1:100
SITE LOCATION
LEGEND
GRASS 1
GRASS 2
GRASS 3
GRASS 4
COMPACTED AGGREGATE FEATURE PAVING
NOTES:
1: 12 MONTHS MAINTENANCE OF ALL NEW PLANTING
2: TREES & SHRUBS MARKED T RETAINED AND PROTECTED
3: AVOID USE OF FERTILISERS IN SWALE AREA
4: TREE GUARDS OR STAKES ARE NOT REQUIRED
PLANT SCHEDULE
Species | Code | Size | m/ctrs² | Qty
Grass 1
Lomandra micrantha ssp micrantha | tube | 0.3m | 120
Grass 2
Juncus krausii | tube | 0.4m | 30
Juncus pallidus | tube | 0.4m | 30
Grass 3
Isolepis nodosa | tube | 0.4m | 60
Grass 4
Dianella 'little rev' | tube | 0.4m | 120
SET OUT NOTES | TOTAL | 360
All species in clusteres of flowing bands along contours
Species may overlap planting group boundaries
Favour planting to areas above sleepers
COMPACTED AGGREGATE FEATURE PAVING N.T.S.
CITY OF TEA TREE GULLY
PROJECT: BANKSIA BIORETENTION SWALE PLANTING PLAN
Sheet 1 of 1
Drawing No. 19/LS/01

Juncus pallidus successfully established in the pipe outfall area

The project described in this case study was undertaken with the support of

CITY OF TEA TREE GULLY
Naturally Better

Australian Government
Department of the Environment, Water, Heritage and the Arts

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IF YOU HAVE A WSUD PROJECT THAT WOULD MAKE A GOOD CASE STUDY, CONTACT:

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