Water Sensitive Urban Design

SITE PLANNING AND URBAN DESIGN IN THE COASTAL DRY TROPICS

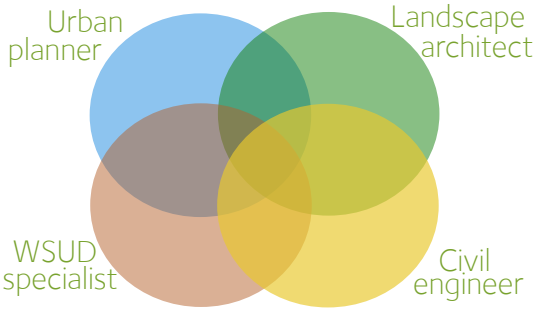
Purpose of this fact sheet:

This fact sheet provides advice to the development industry on developing a comprehensive approach to applying Water Sensitive Urban Design in the Coastal Dry Tropics Region.

Establishing a collaborative design team

Successful implementation of WSUD Strategy requires an integrated design approach, meaning collaboration between the disciplines and consistency in the design phases through to construction. WSUD Specialists *must* be involved in the full urban design, design development and detailed design process. We suggest this design approach (see figure below) is adopted for all WSUD in the Dry Tropics with an appropriate WSUD specialist working closely with urban planners, engineering and landscape consultants.

INTEGRATION DESIGN PROCESS



Constructed wetland integrated into the urban landscape

KEY POINTS OF THIS FACT SHEET

This fact sheet provides advice to professionals in the development industry to develop an understanding of

- Establishing a collaborative design team
- How to apply WSUD principles to a range of site conditions

City of Townsville

Developing a successful WSUD design approach

There are a number of important stages in the successful planning and design of a WSUD strategy.

1. Site interpretation

Understanding the characteristics of the site is critical in achieving WSUD principles of sustainable and integrated management of land and water resources, and incorporating best practice stormwater management, water conservation/reuse and environmental protection. This requires developing an understanding of site geology, hydrology, ecology and environmental conditions.

Topography and drainage

Steep vs flat sites (available level differences will determine the most appropriate WSUD stormwater
treatment train)

Hydrology and Climate

Natural aquatic ecosystems and landscapes within the Dry Tropics region experience drying conditions during part of the year. The implementation of current best practice WSUD technologies that utilise vegetative systems to promote the interception, adsorption and biological processing of water borne pollutants need to account
for this drying characteristic.

Need to understand:

- Catchment rainfall patterns
- Intensity, frequency and duration of local storm events
- % Impervious areas

Soils

Geotechnical assessment of sites are necessary to identify:

- Dispersive or acid sulphate soils
- Contaminated land
- Soil moisture storage characteristics
- Infiltration to groundwater
- Previous land use

Streetscape bioretention

Ecological Values

Environmental assessment of sites are required to identify:

- Ability to retain significant vegetation
- Sensitive species
- Rare, threatened or endangered species

Receiving Environment

Need to identify if the receiving environment is:

- Already degraded - Rehabilitation may improve ecological function and economic value of the site
- Sensitive to changes in hydrology or water quality - special consideration will be needed in treatment design

2. Set Objectives

Ecological Protection

Mitigate impacts on downstream receiving environments.

Best Practice WSUD Objectives

- >80% reduction in the mean annual load of Total Suspended Solids (TSS)
- >65% reduction in the mean annual load of Total Phosphorus (TP)
- >40% reduction in the mean annual load of Total Nitrogen (TN)
- >90% reduction in the mean annual load of Gross Pollutants

Potable Water Conservation

Mandatory water savings targets apply to new houses in Queensland. The targets are designed to make a significant contribution to reducing the demand for drinking water.

Landscape Integration

The landscape design should ensure that infrastructure associated with the treatment of stormwater is readily incorporated into the urban design and parkland landscapes. The intention is to ensure functional management of stormwater through WSUD systems that enhance parkscapes while promoting stormwater and waterways as valuable resources.3. Design Responses

Water Sensitive Urban Design End-of-line treatment systems

- For steep sites (grades greater than 4%), larger 'end-of-line' bioretention systems are recommended - flows are collected in traditional stormwater networks and piped to the bioretention surface.
- These systems are able to accept stormwater from large catchments
- They result in fewer treatment systems needing to be built. This however puts all the 'eggs in one basket' which can be more expensive if a system needs to be reset.
- They require larger levels differences to ensure the systems are able to receive stormwater to the bioretention surface and then be able to freely drain to the receiving environment. This may result in the systems having to be depressed into the surrounding landscape.
- End of line systems work better on steeper sites - on flat sites, large pipes laid on flat grade would be necessary to pipe stormwater to the surface creating additional cost.

Streetscape treatment systems

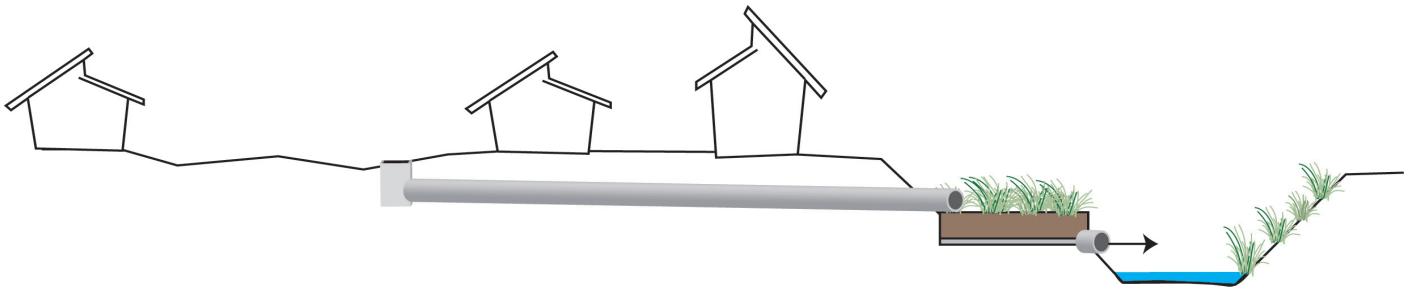
- For flat sites (grades less than 4%) streetscape treatment systems are recommended. Stormwater is treated at surface (rather than being piped in large pipes laid on a flat grade).
- Stormwater is conveyed along the road surface (gutters) to reach the raingardens.
- Surface water can only be conveyed about 80-100m at surface before the capacity of gutters is exceeded. This results in the raingardens treating smaller catchment areas. The urban design response to this is to incorporate raingardens into nodes of landscape embellishment such as traffic slow down points and intersections
- Raingardens then become part of the landscaped streetscape providing potable water savings - stormwater that previously would have drained into underground pipes is instead used to as passive irrigation which offsets the need to use potable water for irrigation – and is consistent with the philosophy of using fit-for-purpose water supplies
- Integration into the landscape adds function and character to landscape
- Residents are able to make a visual connection between their local urban environment and the stormwater treatment systems - this clear visual link between roads and 'raingardens' would encourage residents to take ownership of their streetscape.

The adoption of either approach or a combination should ideally be done in conjunction with the master planners for the site in order to determine the best location for these systems.

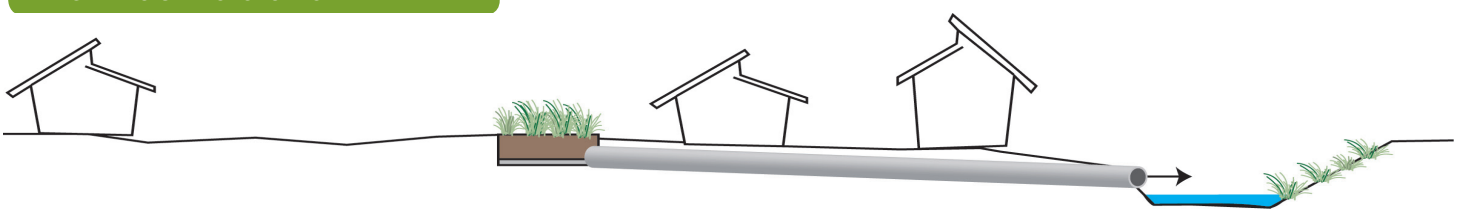
4. Modelling to Test Alternative Concepts

The design alternatives should be tested with a quantitative modelling program (e.g. MUSIC) to determine the treatment area to deliver the stormwater quality improvement objectives. This assessment should be undertaken by a WSUD specialist and where possible this modelling should be based on local rainfall data, the proposed configuration of the system, and based on local stormwater treatment performance data.

TYPICAL DESIGN RESPONSE FOR STEEP TERRAIN



TYPICAL DESIGN RESPONSE FOR FLAT TERRAIN



creektocoral
our waterways - our responsibility

City of Townsville