



Water Sensitive Urban Design in Townsville City

Insights and lessons learned...

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Why improve urban (storm)water quality?

We all have an interest!

- » **Reduces impacts on natural values** (MNES, MSES and MLES)
 - Great Barrier Reef Marine Park and World Heritage Area
 - Significant Wetlands such as RAMSAR listed or Wetland of National Significance
 - Other locally significant waterways and natural areas
- » **Reduces impacts on stormwater assets and infrastructure**
 - State and Local assets
- » **Provides amenity, promotes tourism and recreation opportunities and reduces community complaints**



What is Water Sensitive Urban Design?

- » *A holistic approach to the planning, design, assessment, construction and maintenance of new or retrofitted urban development.*
- » *Promotes the integration of stormwater, water supply and sewage management within a development precinct.*
- » *Aims to minimise negative impacts on the natural water cycle and protect the health of aquatic ecosystems.*
- » *Provides amenity, livability and social outcomes.*

WSUD: Stormwater management

Which measure and why?

WSUD Measure	Water Quality Treatment	Peak Flow Attenuation *	Reduction in Runoff Volume *
Swales and buffer strips	M	L	L
Bioretention Swales	H	M	L
Sedimentation basins	M	M	L
Bioretention basins	H	M	L
Constructed wetlands	H	H	L
Infiltration measures	H	H	H
Sand filters	M	L	L
Aquifer storage and recovery	H	H	H

WSUD: Stormwater management

Which measure and why?

Particle Size Grading	Management Issue					Treatment Process
	Visual	Sediment	Organics	Nutrients	Metals	
Gross Solids > 5000 μm	Litter	Gravel	Plant Debris			Screening
Coarse- to Medium- 5000 μm – 125 μm		Silt				Sedimentation
Fine Particulates 125 μm – 10 μm				Particulate	Particulate	Enhanced Sedimentation
Very Fine/Colloidal 10 μm – 0.45 μm	Turbidity		Natural & Anthropogenic Materials	Soluble	Colloidal	Adhesion and Filtration
Dissolved Particles < 0.45 μm						Biological Uptake

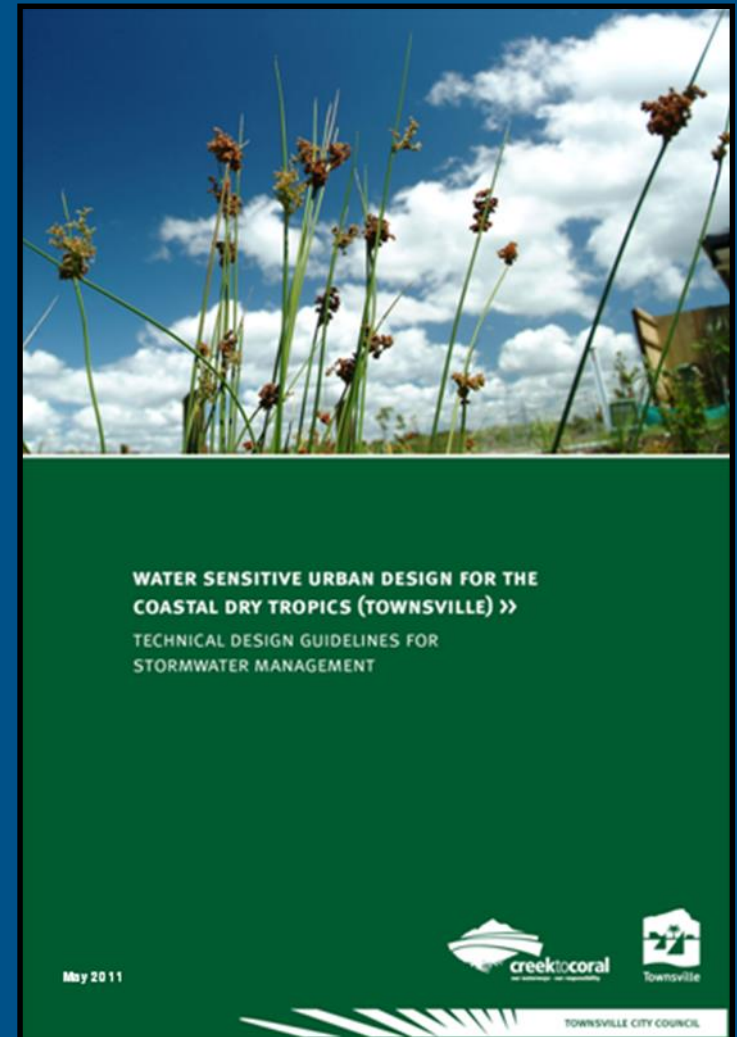
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Stormwater quality improvement measures

- » Swales
- » Bio-retention Swales
- » Sediment Basins
- » Bio-retention Basins
- » Constructed Stormwater Wetlands
- » Rainwater Tanks
- » Infiltration Measures
- » Sand Filters
- » Aquifer Storage and Recovery

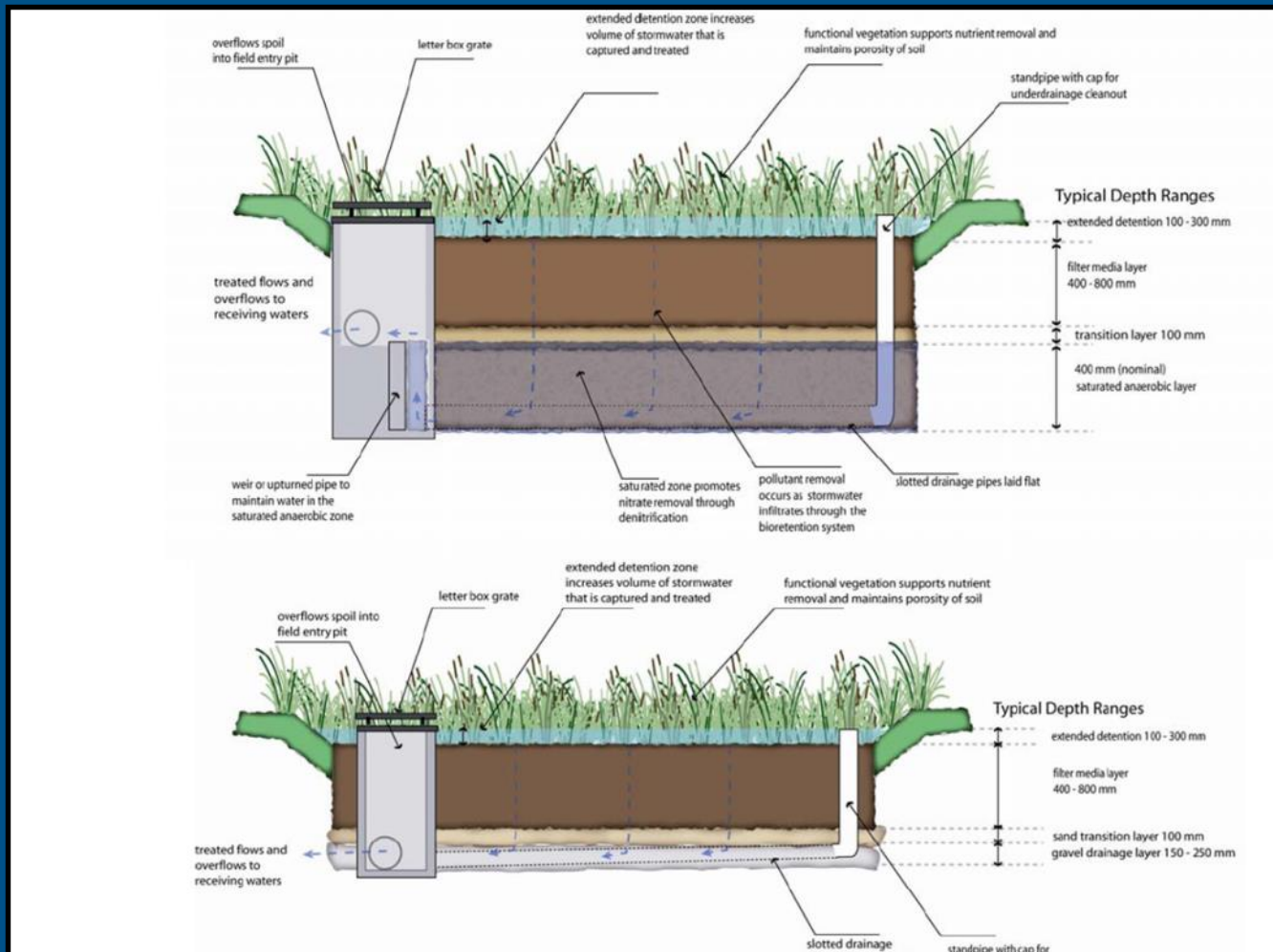
and more recently...

- » Street tree bio-retention
- » Public open space wicking beds



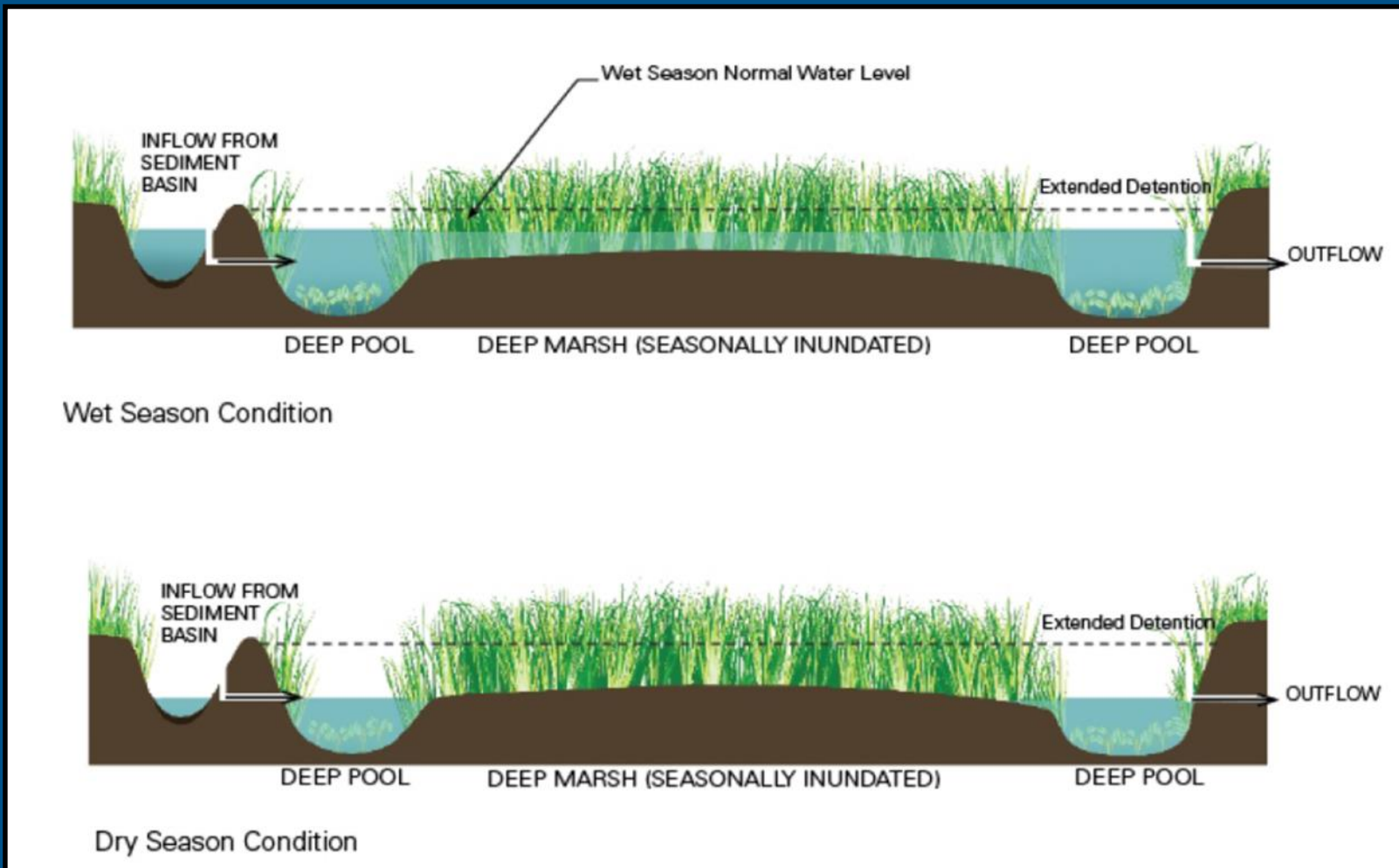
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Bio-retention basins



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Constructed wetlands



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Early days...

Site 1: Osterlund Place (2007)

Not free draining

Blocked with sediment (construction at 90%)

Sulfur smell

Extensive Typha growth

- **Gross pollutant capture**
- **Slow flowing**
- **Claims of respiratory distress**
- **Potential flooding issues**

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Still early days...



▪ **Insufficient underground drainage (2 not 4)**

▪ **Use of degenerative rock**

▪ **Drainage layer above filter media**

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Getting better...



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Challenges and learnings...

Biophysical / climatic / ecological

- » Vegetation selection - long dry period, soils, filter media
- » High intensity rainfall – erosion issues, high flow bypass, asset size
- » Soils (sand, granite, sodic clays) – erosion, vegetation viability
- » Filter media - vegetation viability, infiltration rate, availability
- » Flat sites – drainage, fall
- » Weeds – out compete desired vegetation

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Challenges and learnings continued...

Institutional / Social

- » Interpretation of WSUD principles and practices
- » Capacity and capability
- » Process breakdowns in planning, design, assessment, construction or maintenance stages
- » Development phasing and asset protection
- » High domestic water use – dry season baseflows
- » Large assets (wetland / bio-retention basins) – maintenance
- » Perception that WSUD does not work in Townsville!

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In conclusion...

- Soils: treat or remediate as required.
- Rainfall / climate: size asset(s) appropriately
- Vegetation: fit for purpose, local endemic species
- Know your pollutants/issues: treatment train of several different measures instead of large end of line assets.
- Protect your asset during construction: post remediation is more expensive
- Ensure agreement on issues and possible solutions first
- Don't cut corners: ensure good planning, design, construction, establishment and maintenance.

Questions?



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