

Water Sensitive Urban Design Strategy for Darwin Harbour



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Outline

- What is Water Sensitive Urban Design
- WSUD in the Darwin region
 - Local drivers
 - Local challenges
- Implementation of WSUD in Darwin
 - Policy and planning
 - Technical Guidelines
 - Practical Implementation: Bellamack
- WSUD Elements
- Bellamack

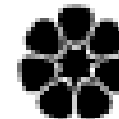
WSUD Strategy

- Joint project between
 - DPI
 - NRETAS
 - Australian Government CCI
- Provision of
 - Policy
 - Tools
 - Resources
 - Training



Australian Government

Department of the Environment, Water, Heritage and the Arts



**Northern
Territory
Government**



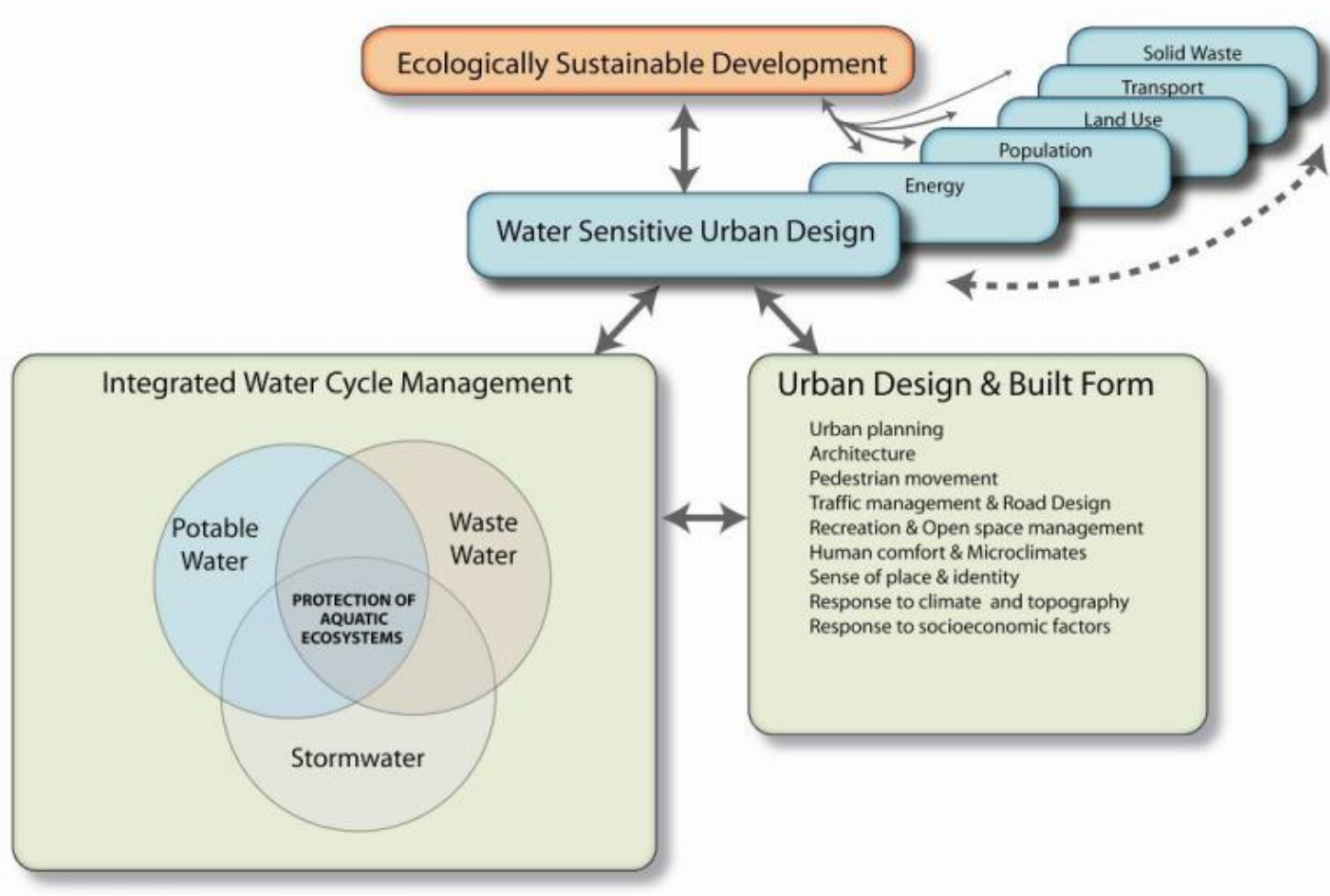
Darwin Harbour Advisory Committee

Water Sensitive Urban Design

- Evolving approach to development
- Holistic approach to planning and design
- WSUD aims to
 - minimise impacts on the natural water cycle
 - protect the health of aquatic ecosystems



Water Sensitive Urban Design



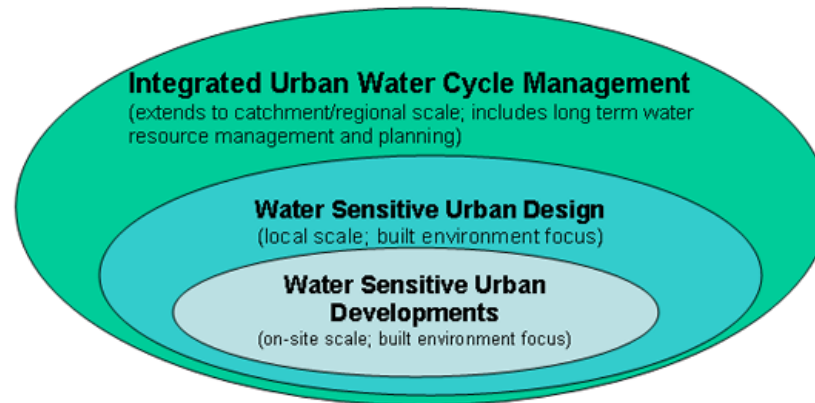
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Water Sensitive Urban Design

- WSUD provides a broad framework for sustainable urban water management
- “WATER SENSITIVE”
 - Sustainable solutions for managing water resources – technical and non-technical (governance)
 - Protecting aquatic ecosystems
- “URBAN DESIGN”
 - Integrating total urban water cycle management into the urban design and built form – planning, landscape architecture, building architecture
 - Enhancing the landscape/recreation/habitat
 - Creating an “Urban Ecology”

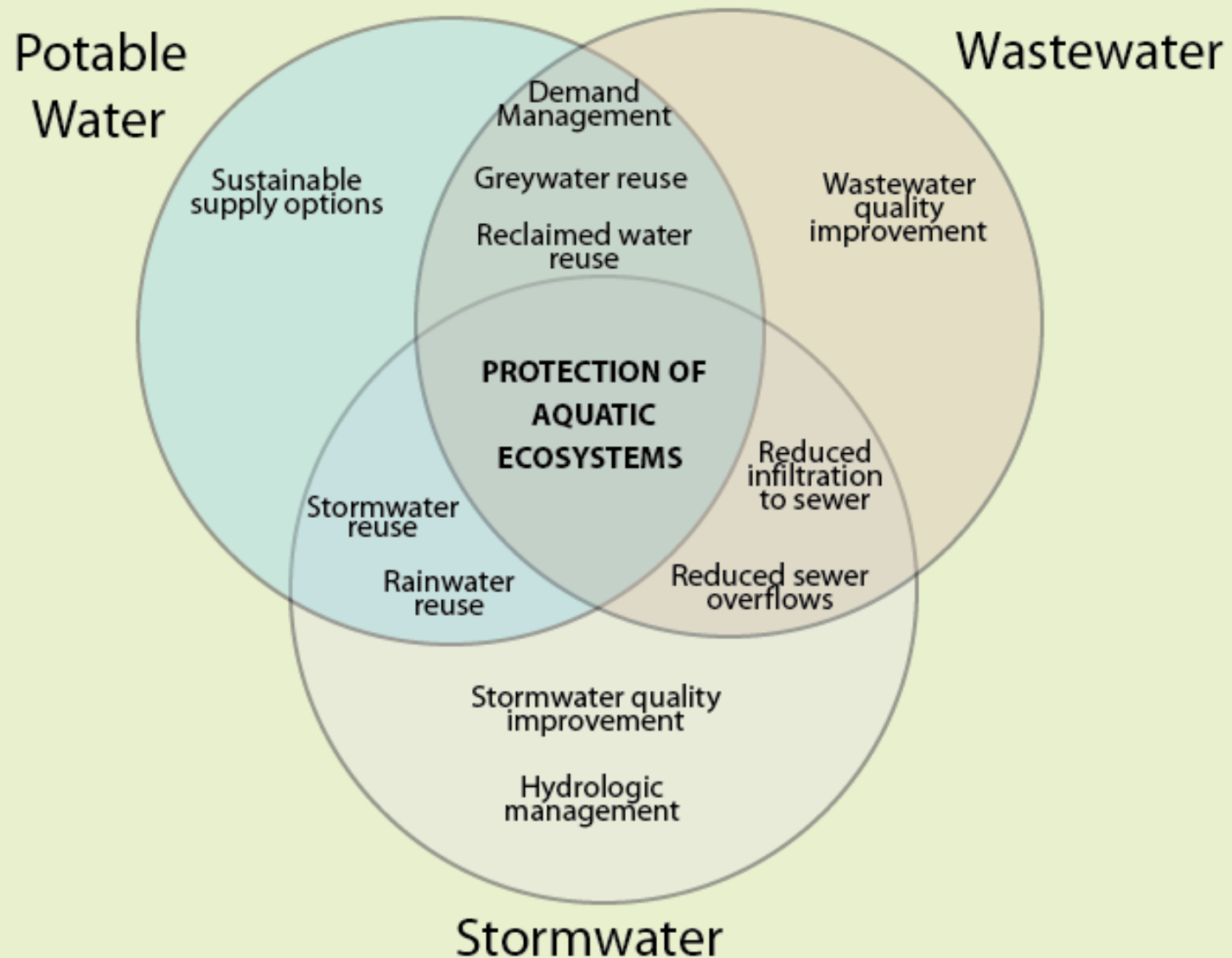
Federal response to WSUD

- National Water Initiative – promotes WSUD
 - *the integration of urban planning with the management, protection and conservation of the urban water cycle, that ensures urban water management is sensitive to natural hydrological and ecological cycles.*
- National Water Quality Management Strategy
 - *Improved developments to achieve of locally adopted water quality and river flow objectives*



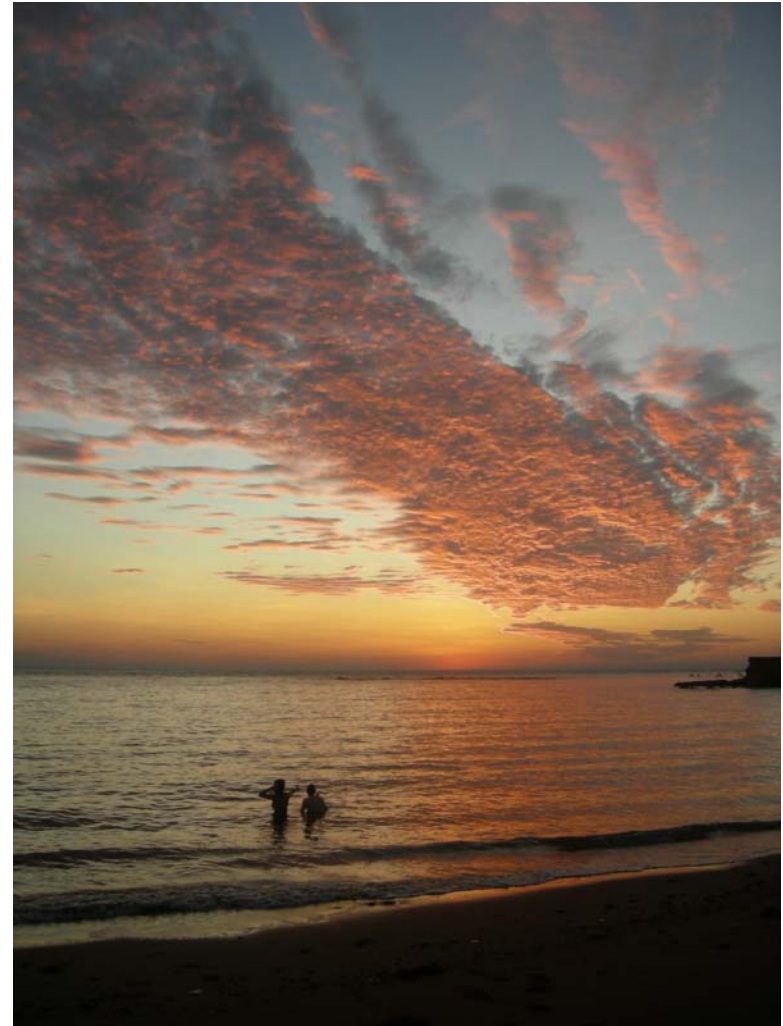
- Australian Runoff Quality (Sister document to ARR)

Integrated Water Cycle Management

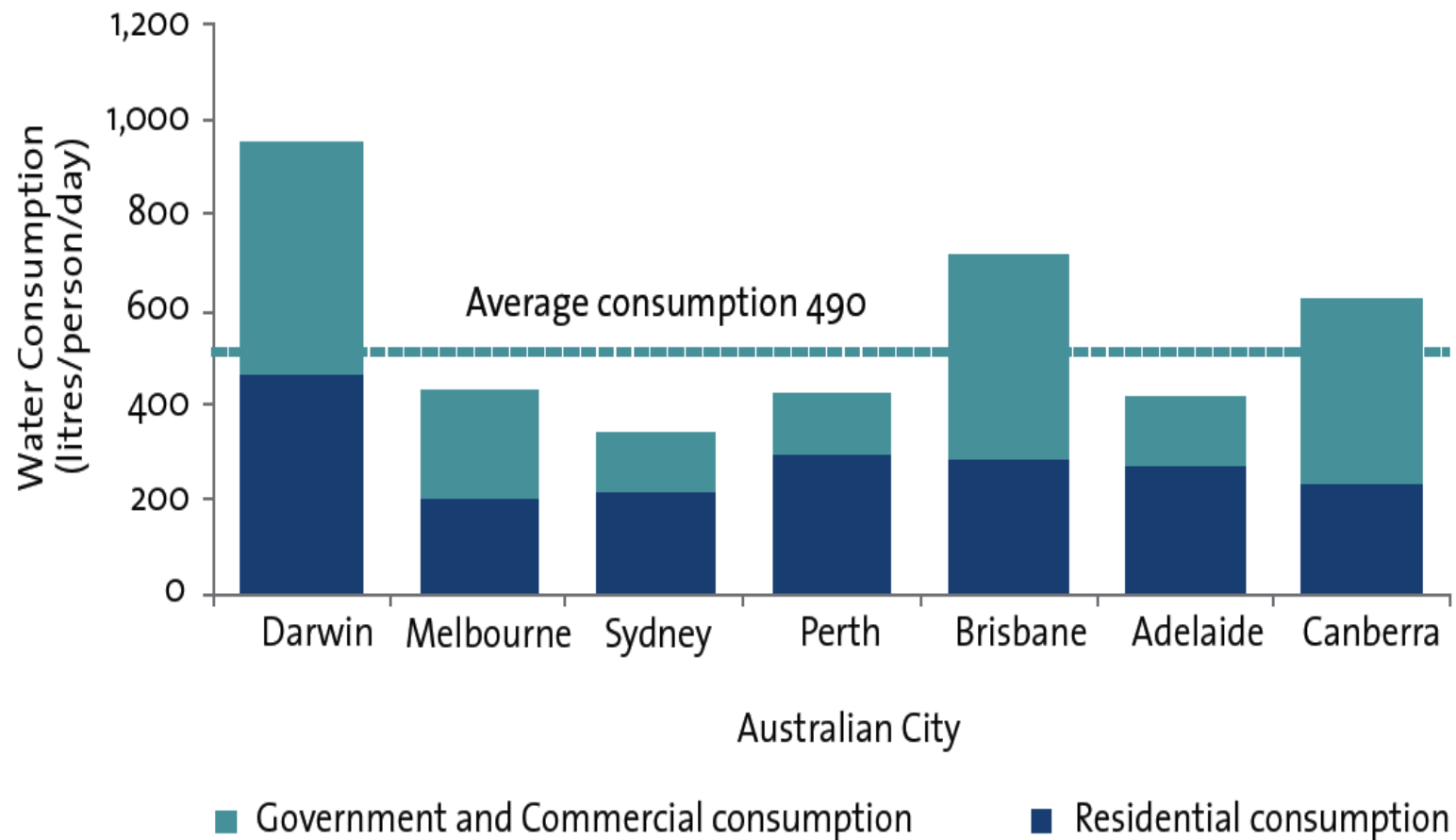


WSUD in Darwin

- Darwin Harbour is a key natural resource, with environmental, social and economic values
- Urban stormwater is a key contributor to pollutant loads in the Harbour
- Development in Darwin is expected to be rapid

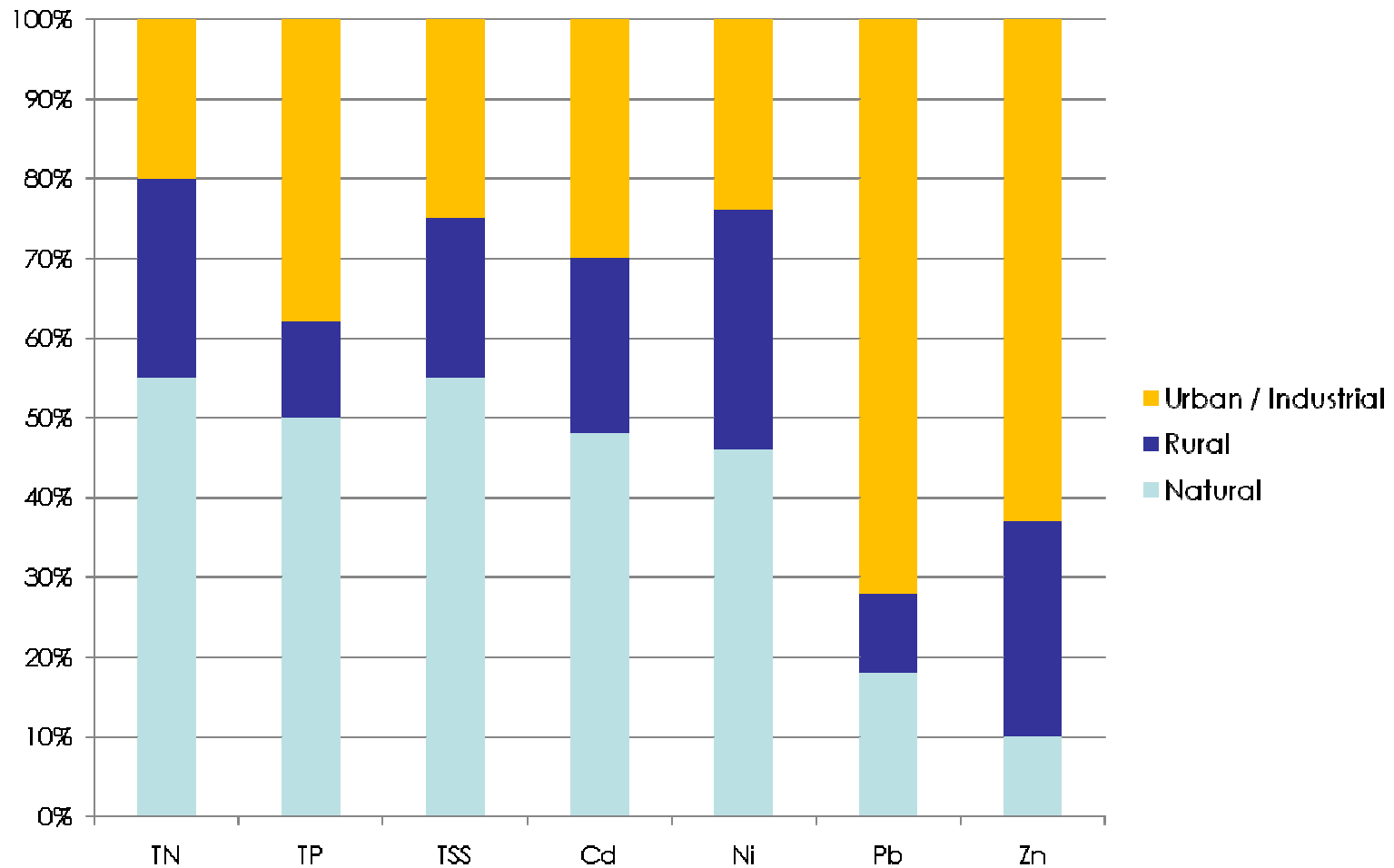


Water consumption litres per person per day for Australian cities



PowerWater 2006

Pollutant loads to Darwin Harbour



Padovan 2001

Waterway impacts

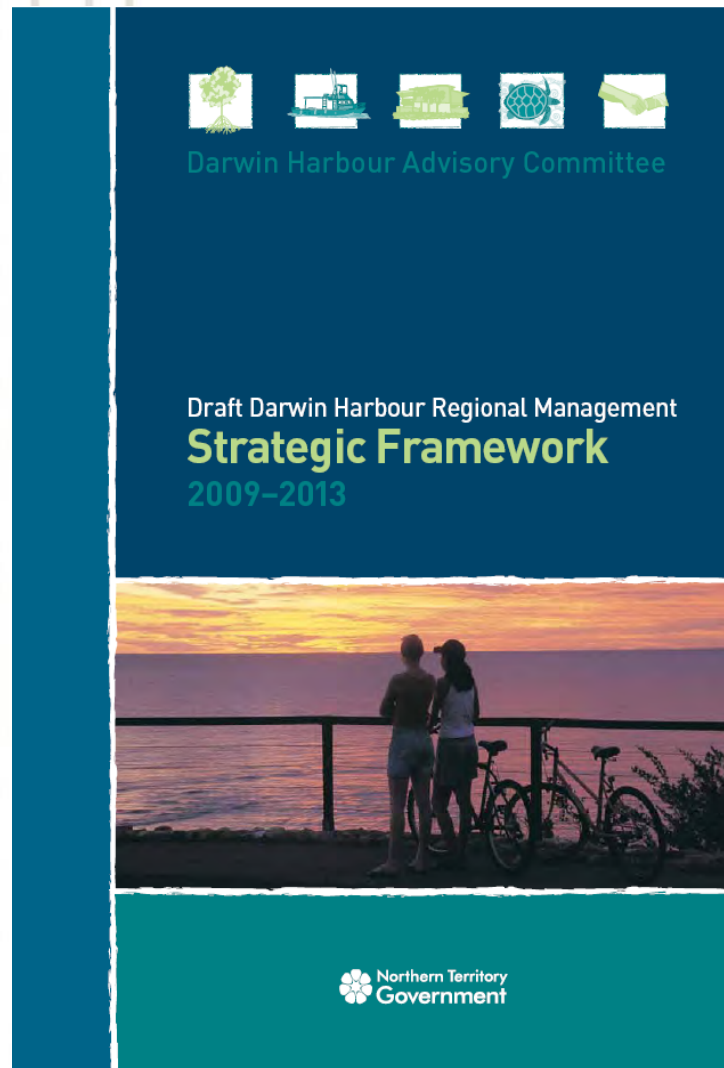


WSUD in Darwin

- Protection of aquatic ecosystems and Darwin Harbour
- Water resource conservation
- Significant pressures from urbanisation
 - 3700 new lots at Palmerston and Northern Suburbs
- Required in new release areas of Palmerston

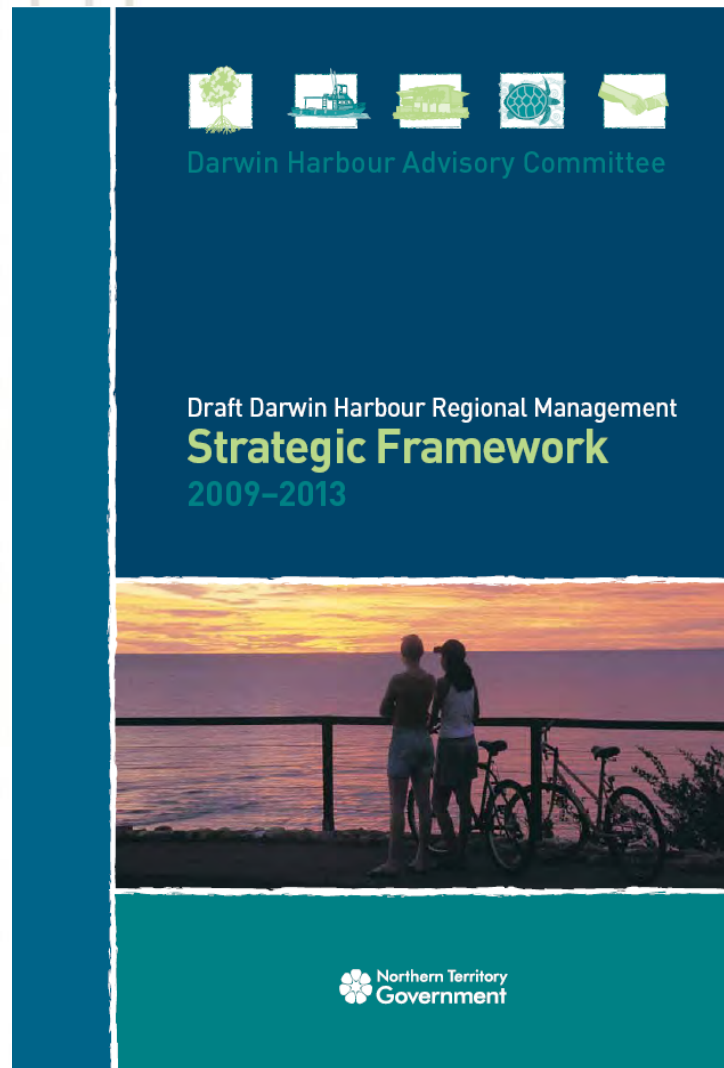


Darwin Harbour Strategy



- Determining **community values** for Darwin Harbour
- Identifying **Beneficial Uses**
- Water quality objectives
- **Decision support tools** to protect Darwin Harbour
- The Darwin Harbour **WSUD Strategy**

Darwin Harbour Strategy



Goal 1: To maintain a healthy environment



Goal 2: To support recreational use and enjoyment of the environment



Goal 3: To ensure that development is implemented in an ecologically sustainable manner



Goal 4: To protect cultural values and heritage



Goal 5: To foster community awareness, industry partnerships and stewardship of the Darwin Harbour region

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Goal 3: Development

- 5. Development should **minimise use of water**, energy, and materials both embodied in infrastructure and during its operation.
- 10. Future **urban development** should be designed and constructed according to **sustainability principles**.
- 17. Residential, Commercial and Industrial developments should incorporate WSUD.
- 19. Any development with the potential to pollute Darwin Harbour should **implement best practice management and pollution control technology to ensure waterways and the Harbour are protected from pollution**.

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Darwin Harbour WSUD Strategy

Darwin Harbour WSUD Strategy

Background Research

- Interviews and Desktop Research
- Implementation and Technical Issues

WSUD Policy and Targets

WSUD Technical Guidelines and Tools

Practical Implementation - Bellamack

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Local Issues

- Climate-related
 - Intense wet season rainfall
 - Treatment system design
 - Rainwater/stormwater reuse effectiveness
- Potable water conservation
 - Solutions for Darwin need to be different
- Mosquitoes
 - Tropical diseases
- Significant gaps in technical knowledge
 - Pollutant loads
 - Pollutant modelling parameters
 - Stream stability processes

WSUD Policy and Targets

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Planning for WSUD

- Darwin Harbour Strategy
- Requirements for WSUD in new release areas by DPI
 - Bellamack and Johnston
- Amendments to NT Planning Scheme
- Incorporation of WSUD into
 - Darwin City Council Development and Subdivision Guidelines (DCCDSG) 2005
 - City of Palmerston Subdivisional Guidelines (CPSG) 2007
- Darwin Harbour WSUD Strategy
- Darwin Harbour WSUD Technical Guidelines

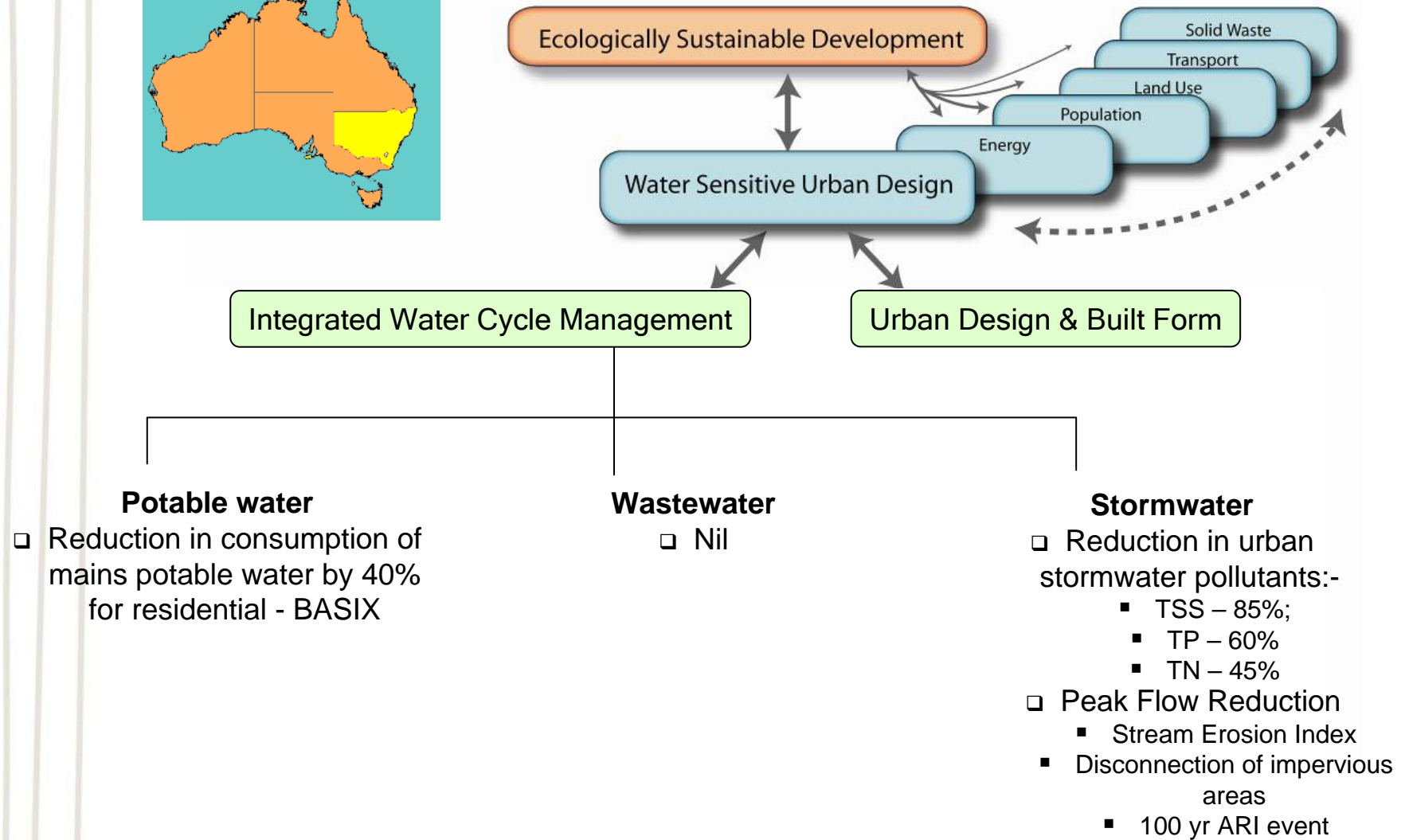
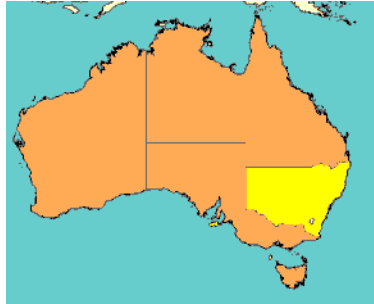
Principles of WSUD

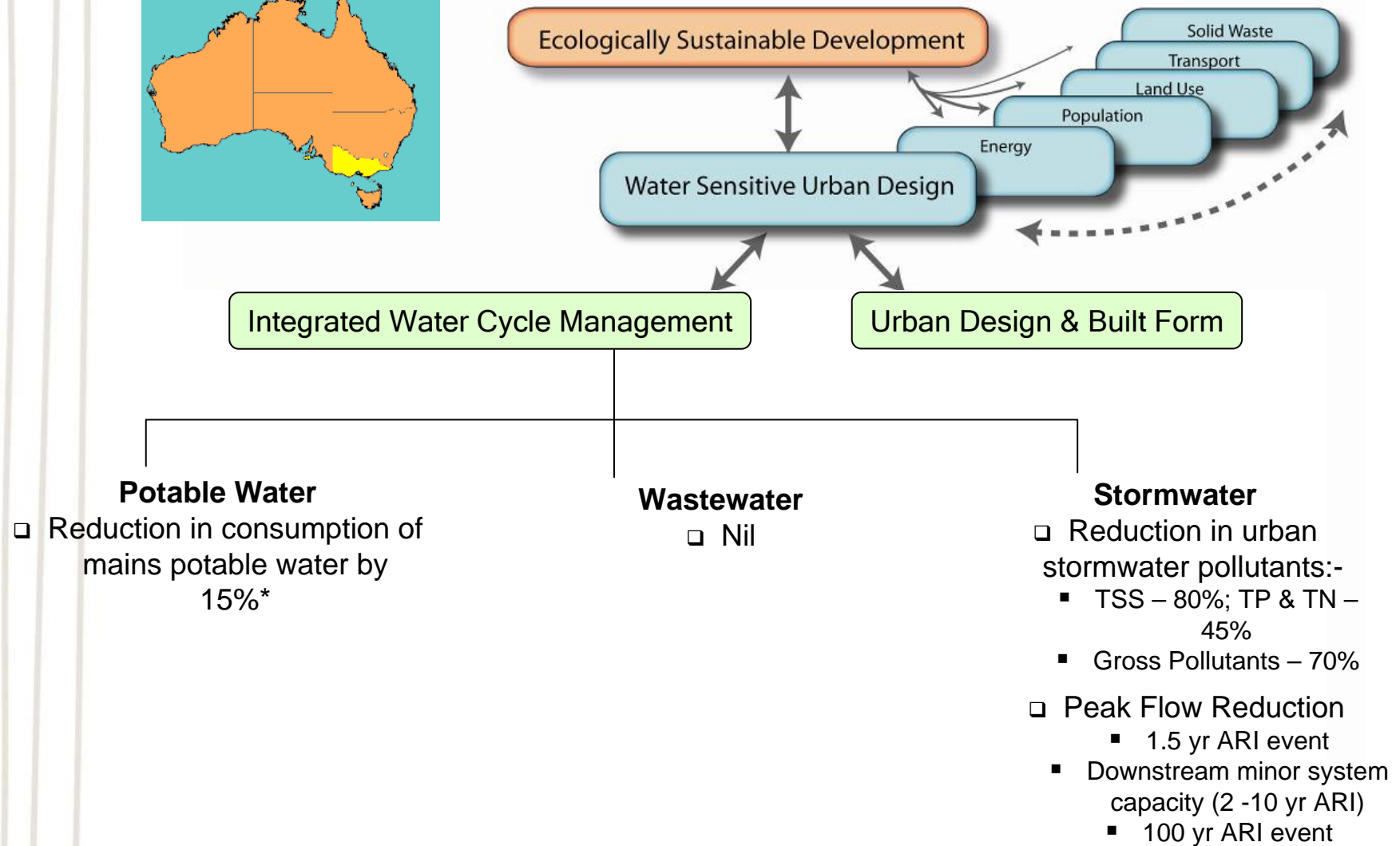
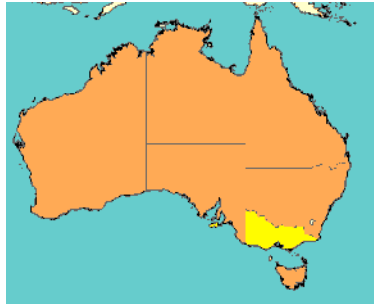
- Protection and enhancement of natural water systems
- Treating urban stormwater to meet water quality objectives for reuse and/or discharge to receiving waters.
- Matching the natural water runoff regime as closely as possible
- Reducing potable water demand
- Minimising wastewater generation and treatment of wastewater to a standard suitable for effluent reuse opportunities
- Integrating stormwater management into the urban landscape

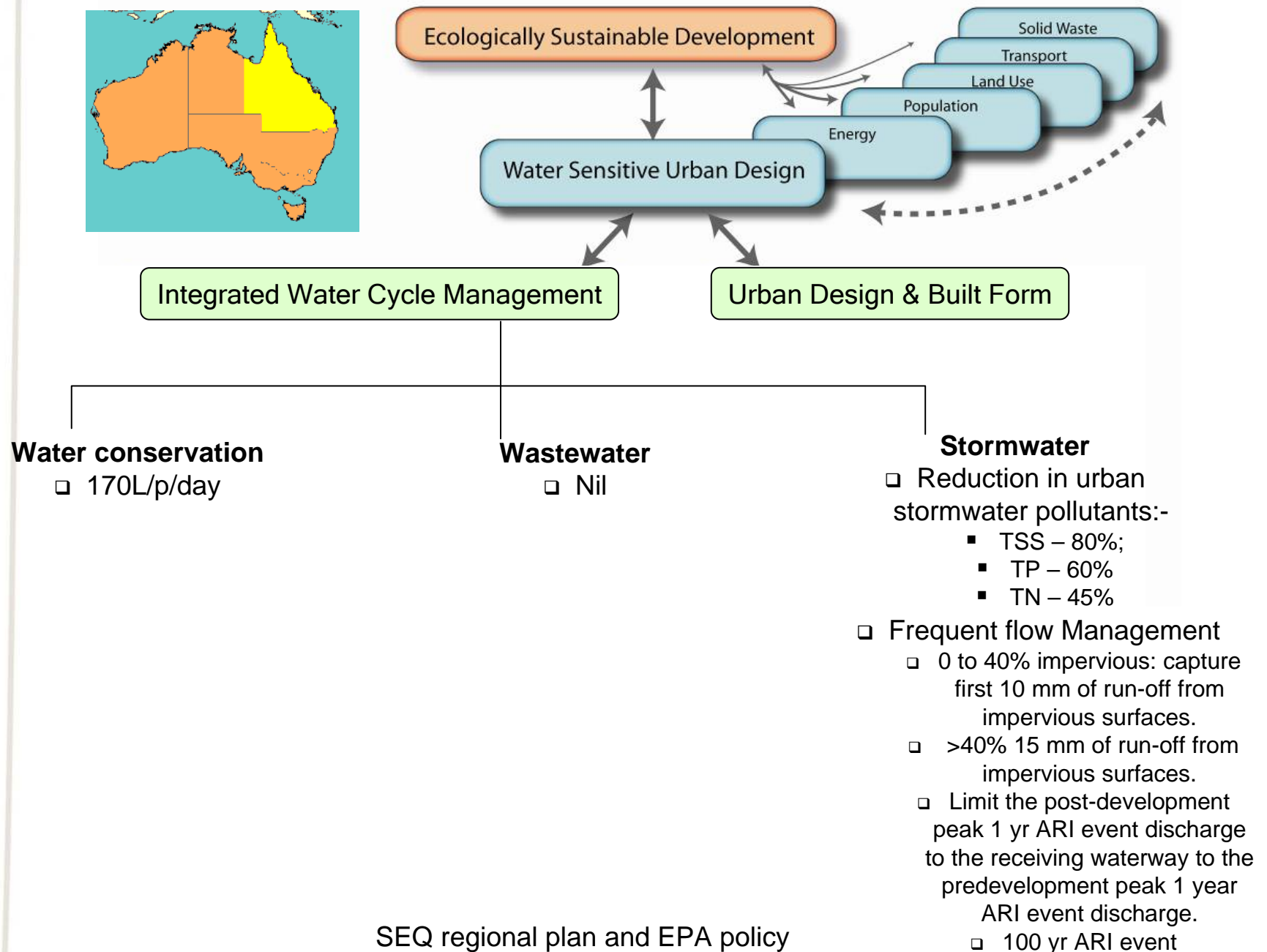
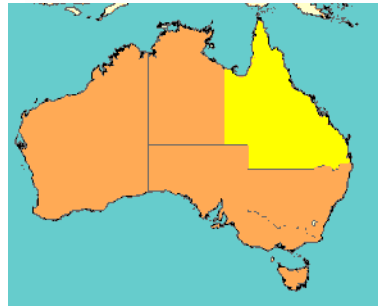


Darwin WSUD objectives

WSUD Objective	Performance Measure/Target
Potable Water Conservation	A 20% water conservation target is considered technically feasible and is suggested as an interim target
Stormwater Quality	<p>Stormwater discharged from development areas to be treated in accordance with best practice:</p> <ul style="list-style-type: none">• 80% reduction in the mean annual load of Total Suspended Solids (TSS)• 60% reduction in the mean annual load of Total Phosphorus (TP)• 45% reduction in the mean annual load of Total Nitrogen (TN)• 90% reduction in the mean annual load of Gross Pollutants





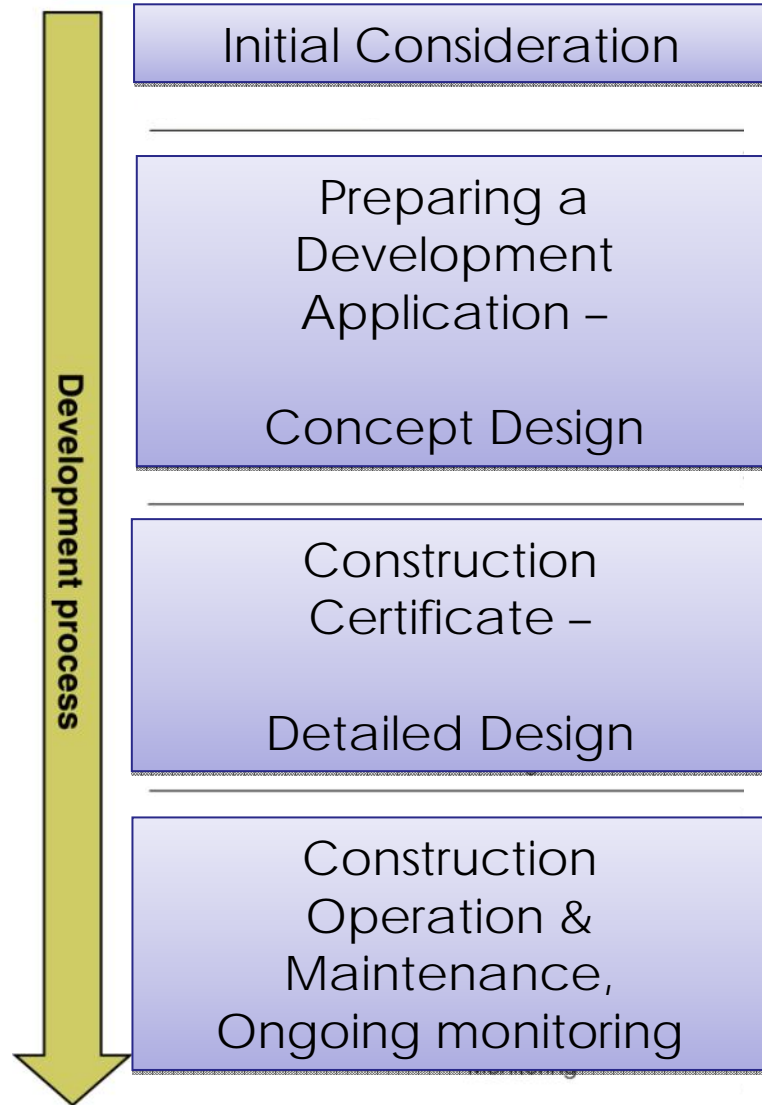


SEQ regional plan and EPA policy

WSUD Technical Guidelines and Tools

Darwin Harbour WSUD Guidelines and Tools

Stages in the development process



Darwin Harbour WSUD Guidelines and Tools

Stages in the development process

Guidelines and Tools available

Initial Consideration

Fact Sheet 1: Introduction to WSUD

Fact Sheet 2: WSUD process, tools and resources

Preparing a Development Application –
Concept Design

Concept design stage

WSUD Planning Guide
(describing how to prepare a WSUD Strategy for a new development)

WSUD Site Assessment Guide

WSUD Concept Design Guide

WSUD Water Quality Modelling Guide

Construction Certificate –
Detailed Design

Detailed design stage

WSUD Technical Design Guideline
(describing how to undertake detailed design for WSUD)

WSUD Standard Drawings

WSUD Vegetation Selection Guide

Construction Operation & Maintenance,
Ongoing monitoring

Implementation stage

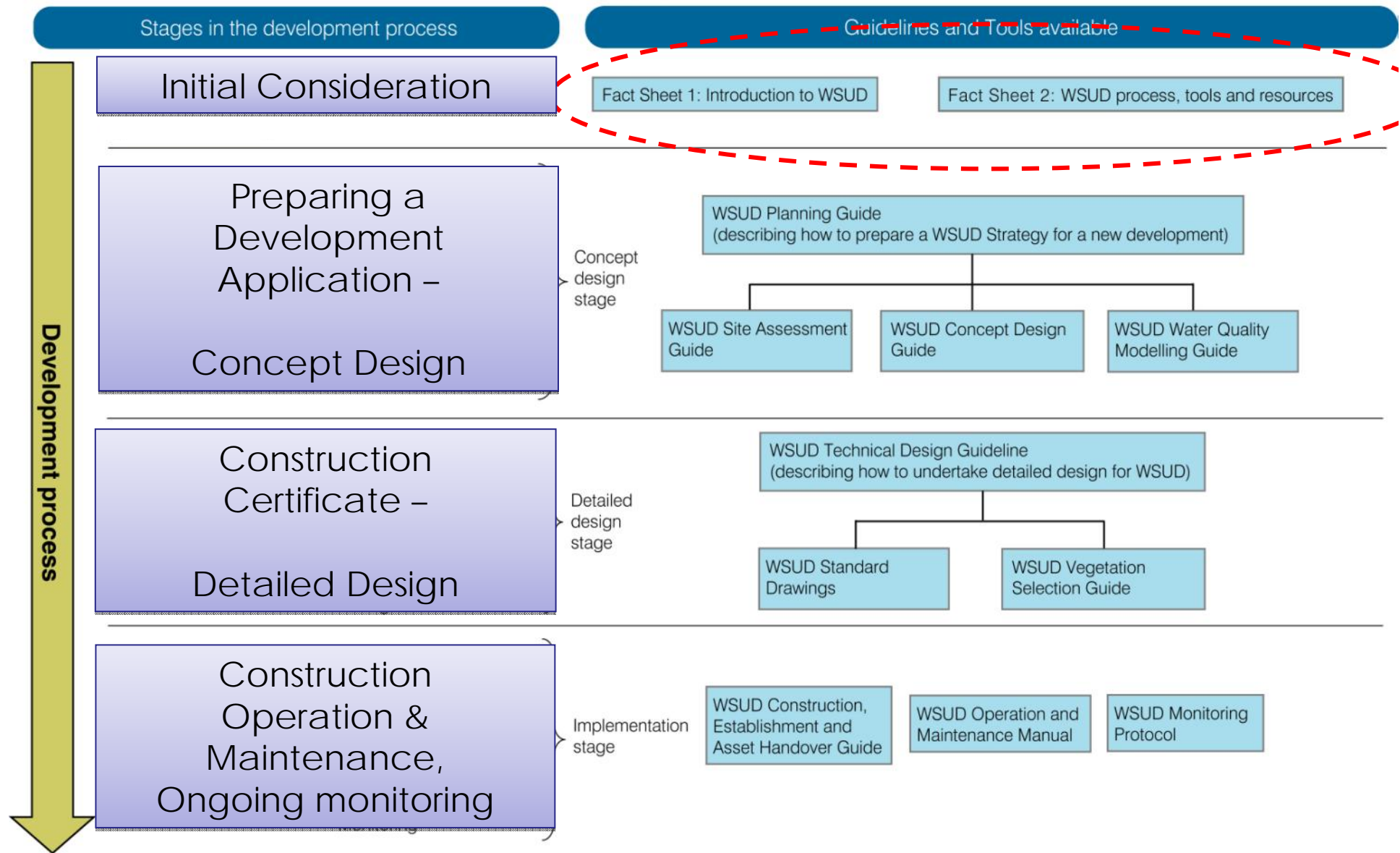
WSUD Construction, Establishment and Asset Handover Guide

WSUD Operation and Maintenance Manual

WSUD Monitoring Protocol

Development process

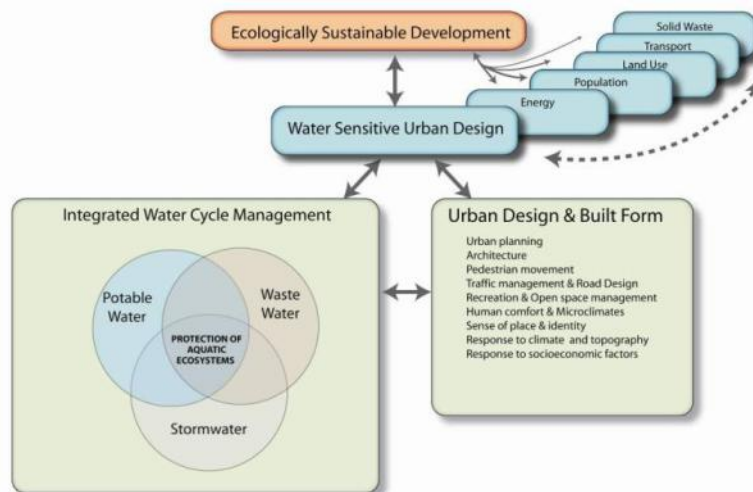
Darwin Harbour WSUD Guidelines and Tools



Fact Sheets

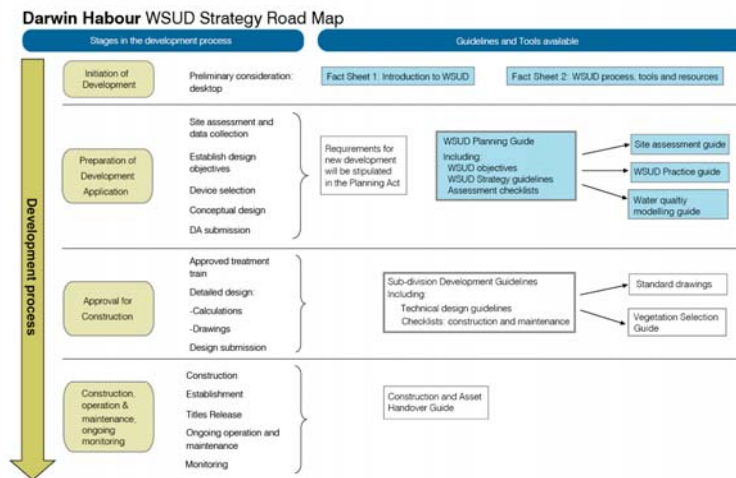
Introduction to WSUD

- Relationships to other plans
- Darwin Harbour Catchment
- WSUD
- Elements of WSUD
- Objectives



WSUD Process Tools and Resources

- Objectives
- Preparing a Water Sensitive Urban Design Strategy



WSUD Elements

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WSUD Elements

- Demand Management
 - Demand Management
 - Water Efficient Landscaping
- Supplementing potable mains water
 - Rainwater harvesting
 - Stormwater harvesting
 - Wastewater Recycling
- Stormwater Treatment
 - Gross Pollutant Traps
 - Vegetated swales & buffers
 - Bioretention systems
 - Wetlands

Demand management

- Water efficient fixtures, fittings and appliances
- Water efficient landscaping and drought tolerant plants
- Efficient water irrigation systems (subsurface, drip systems or rainfall/moisture controlled systems)
- Supplement water supply using alternative sources of water



Potable water supply and treatment plant



MINIMISE

Natural environment
Built environment



Roofwater /
Stormwater



Human consumption - kitchen



Hot water system



Shower and bathroom taps



Clothes washing



Toilet flushing



Garden irrigation

REUSE

Sewerage treatment plant (STP)

Built environment

Natural environment

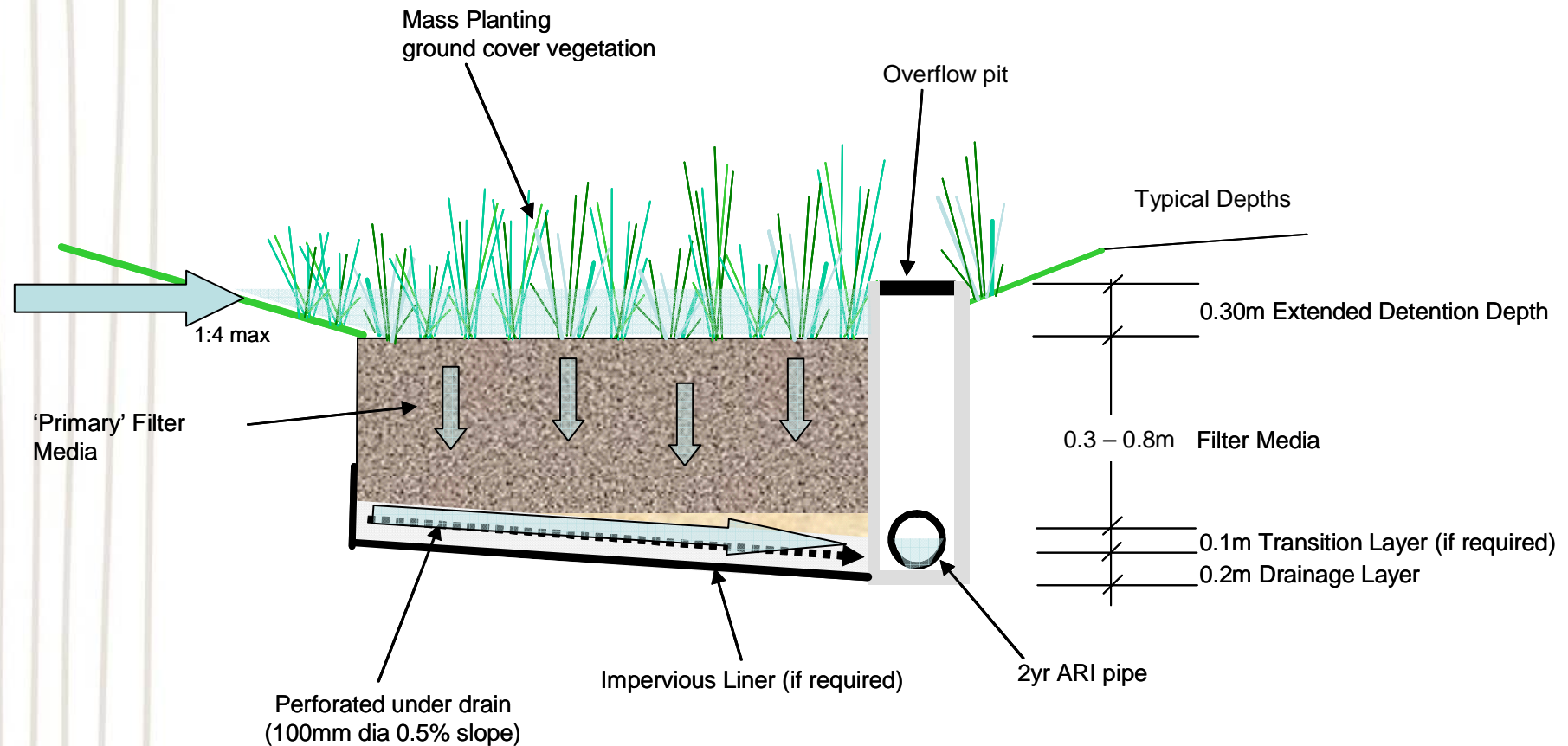
MINIMISE DISCHARGE

PROTECT & ENHANCE ENVIRONMENT

Discharge



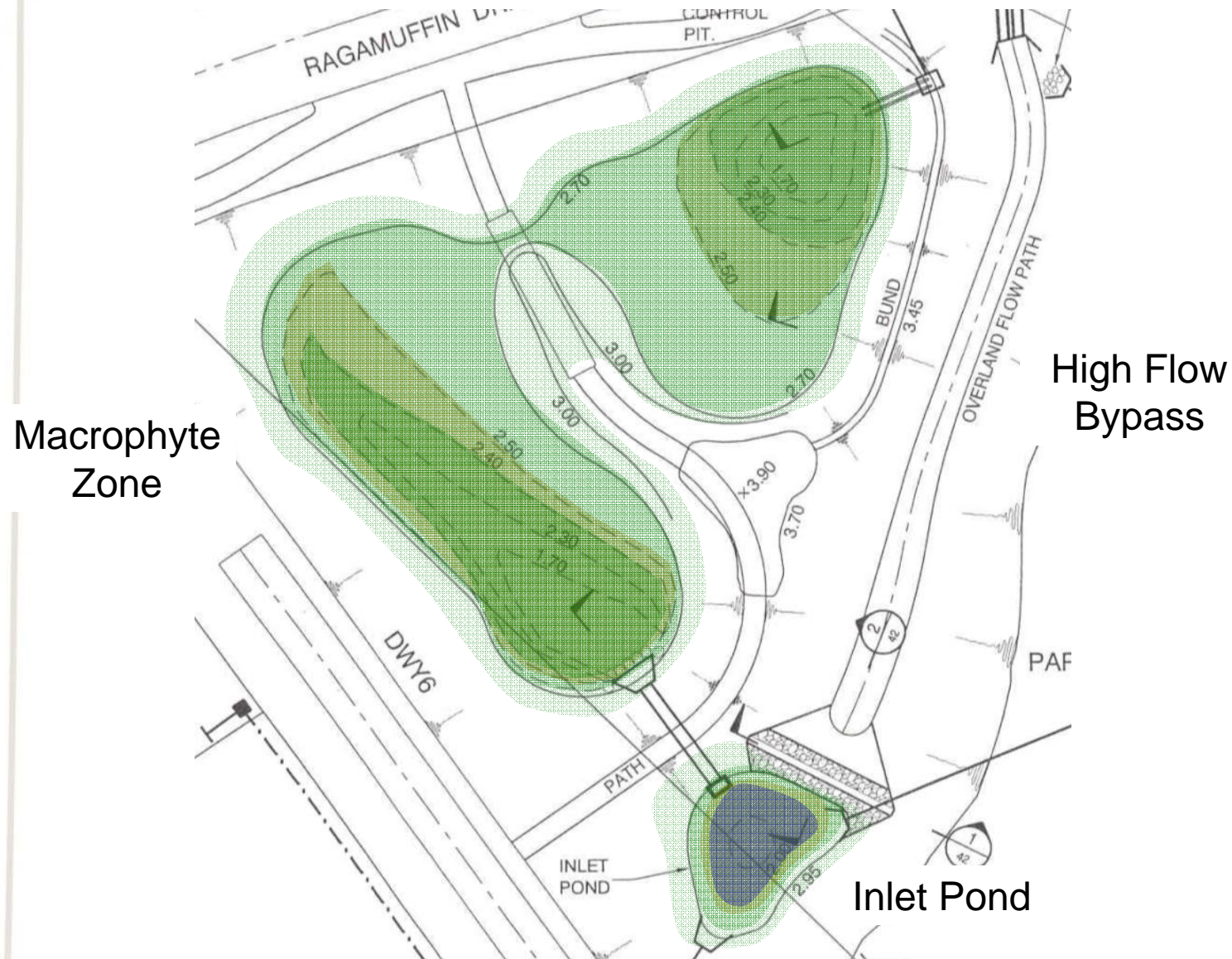
Bioretention Systems



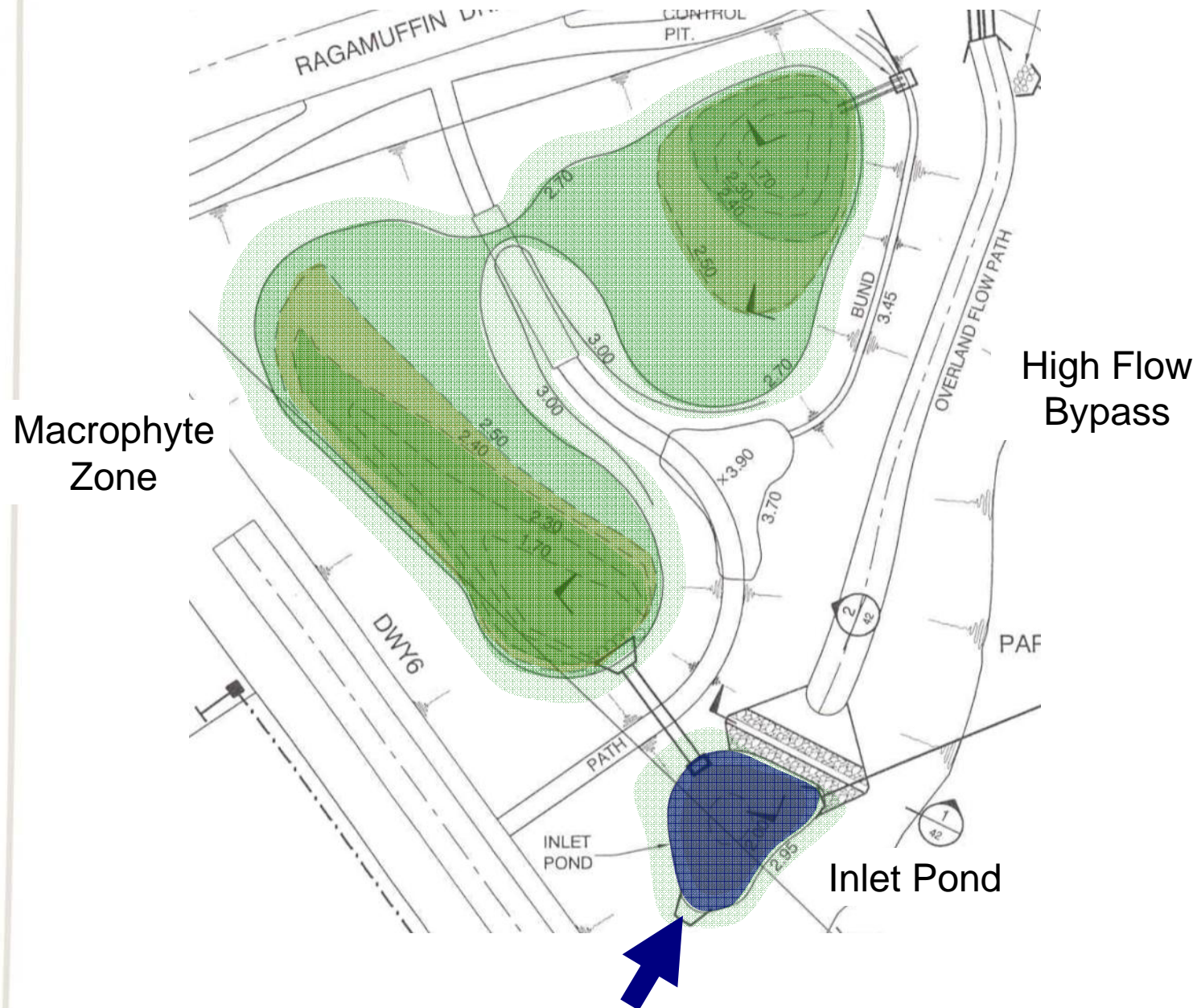
Bioretention Examples



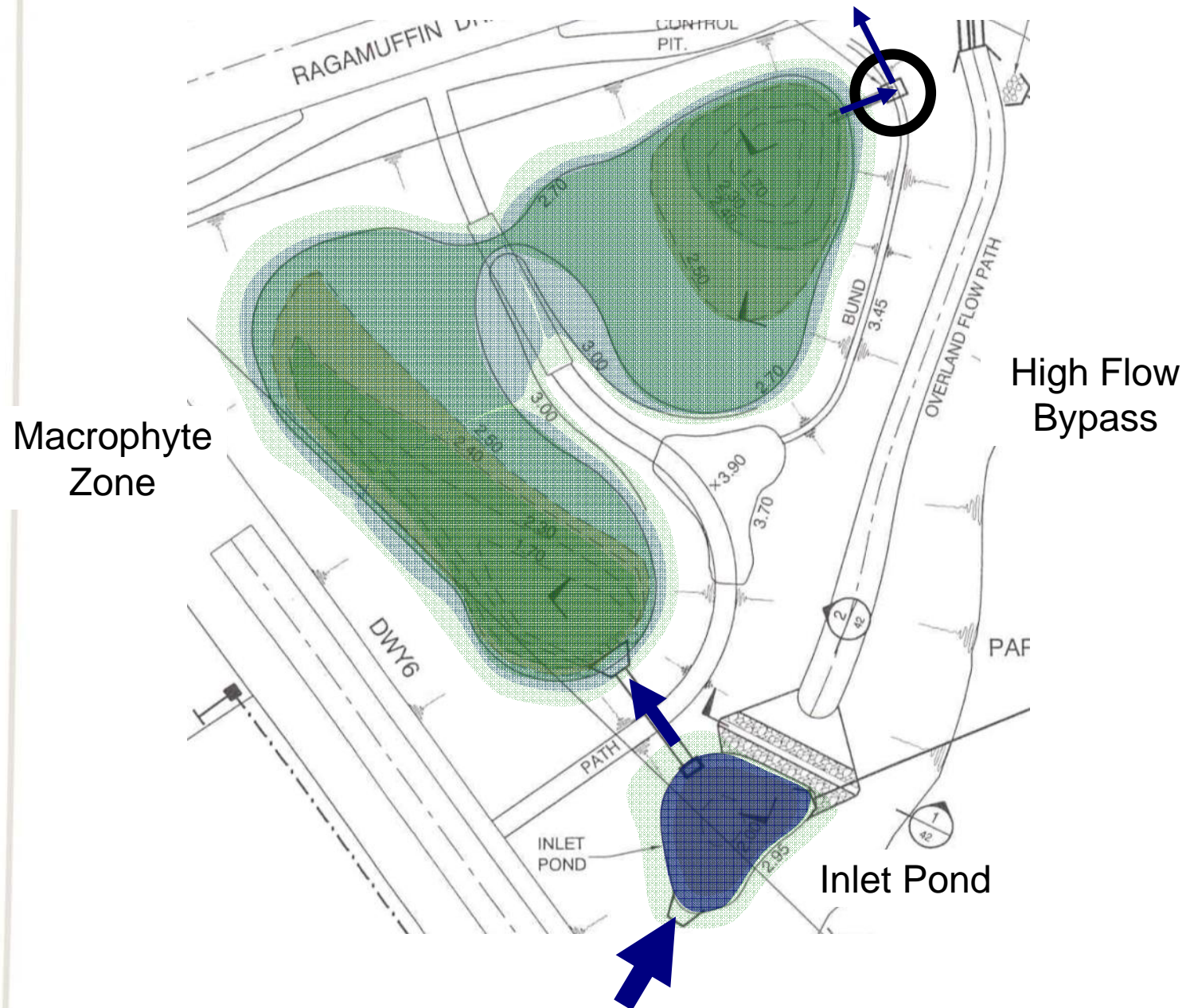
CONSTRUCTED WETLANDS – How they work?



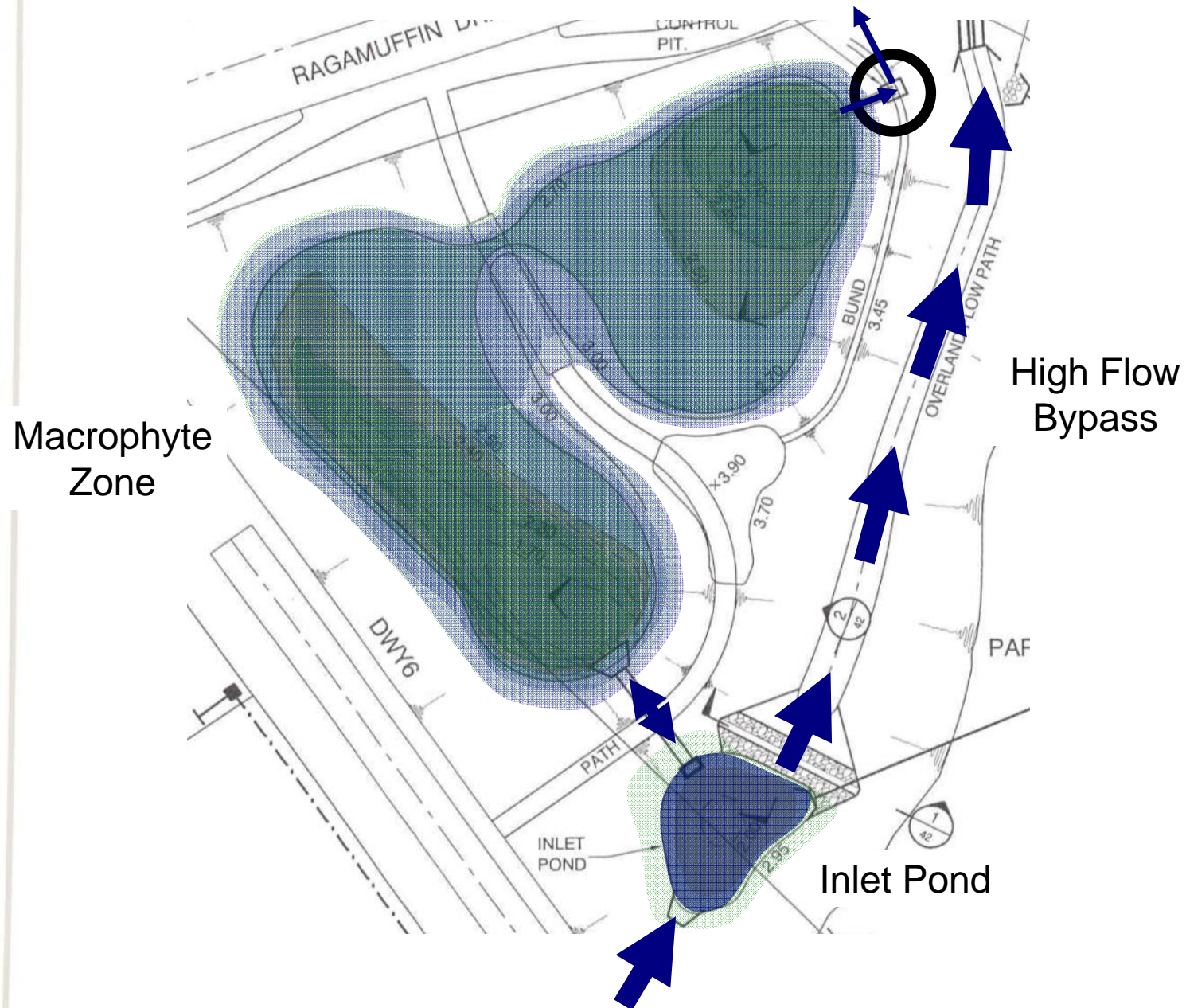
CONSTRUCTED WETLANDS – How they work?



CONSTRUCTED WETLANDS – How they work?



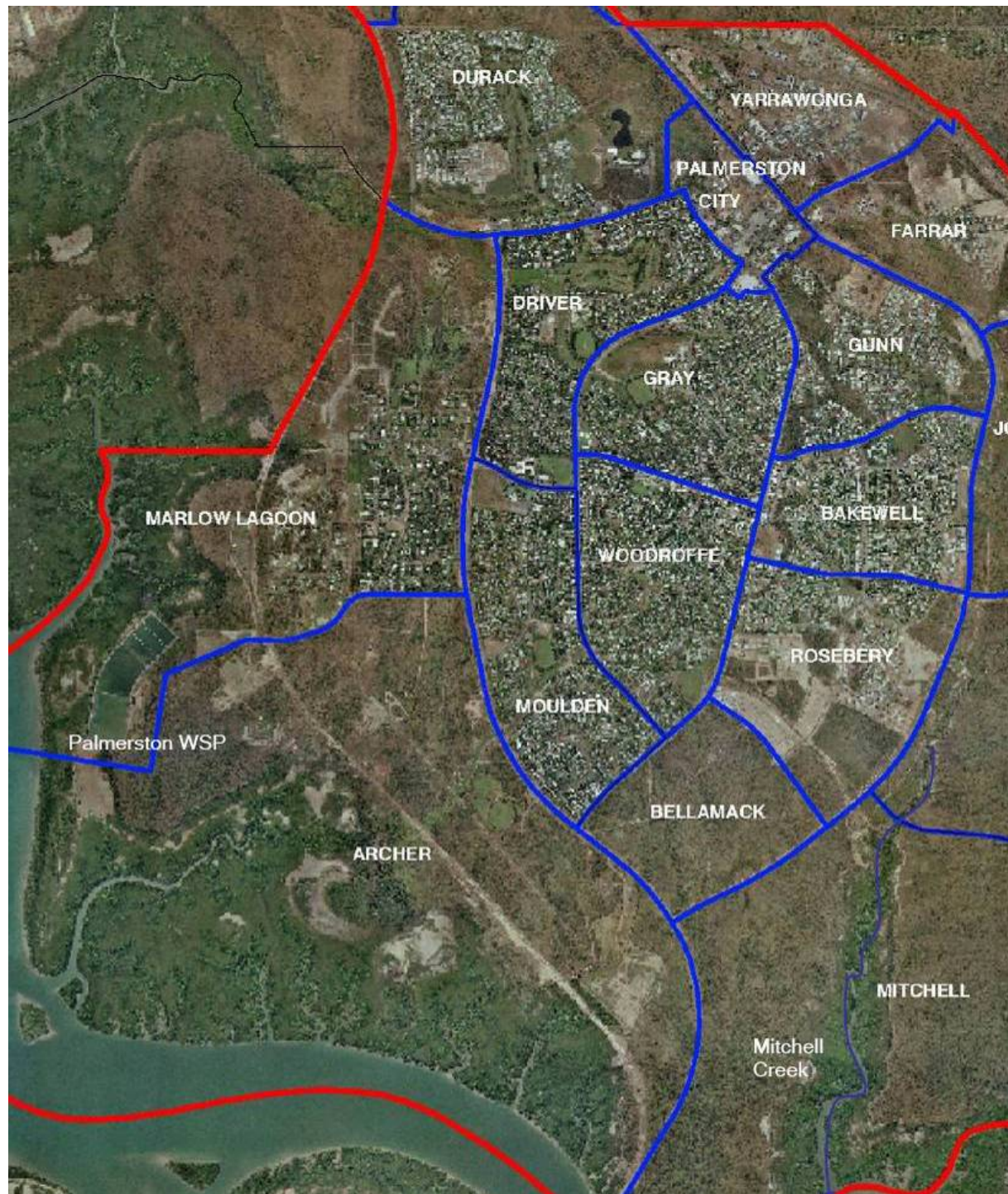
CONSTRUCTED WETLANDS – How they work?



Wetland Examples



Bellamack



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Bellamack

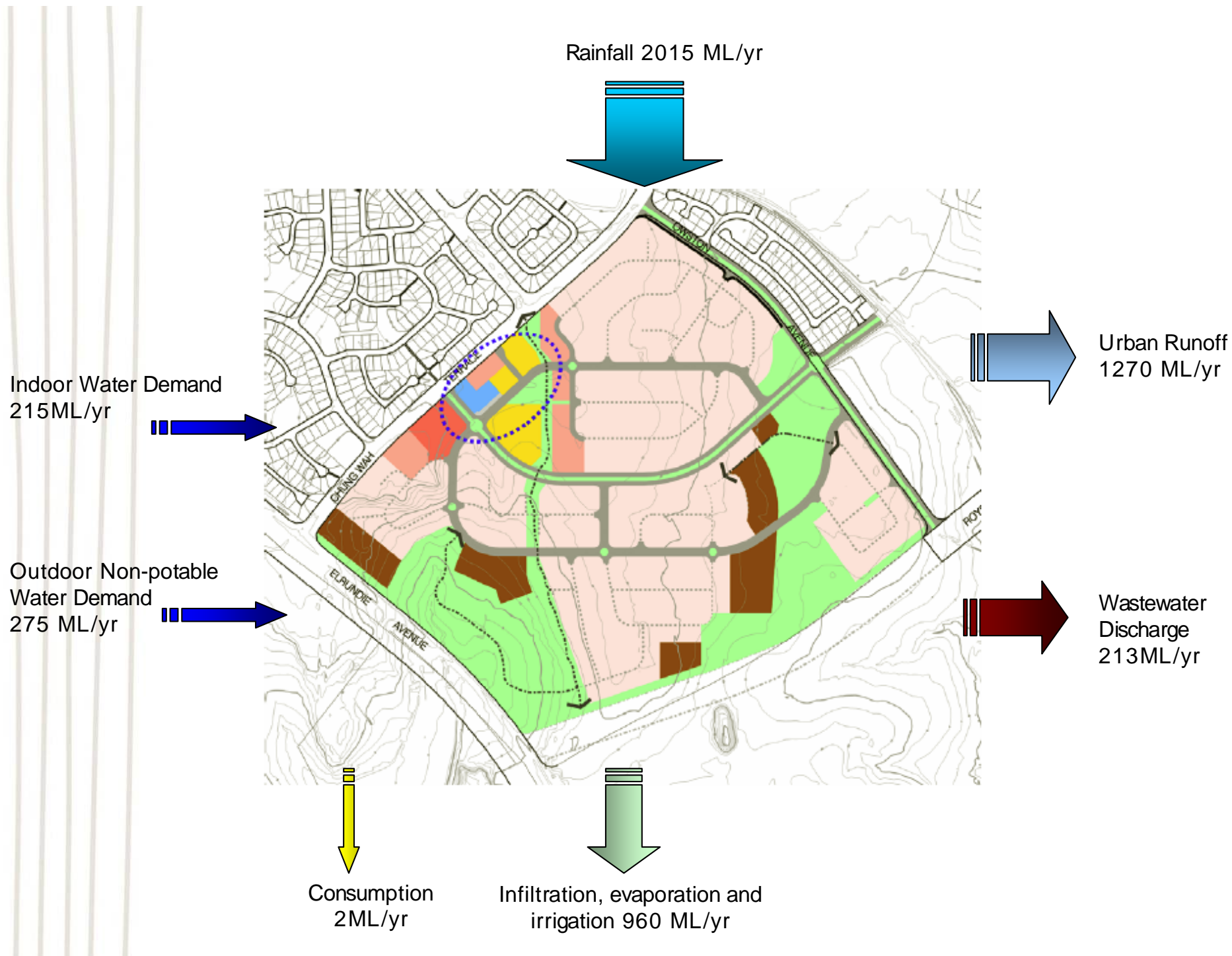
- Total land area = 118.6 ha
- Development area = 75 ha
- Design Principles
 - Water Sensitive Urban Design
 - Circulation
 - Open Space
 - Neighbourhood Centre
 - Housing diversity
 - Climate control and energy efficiency



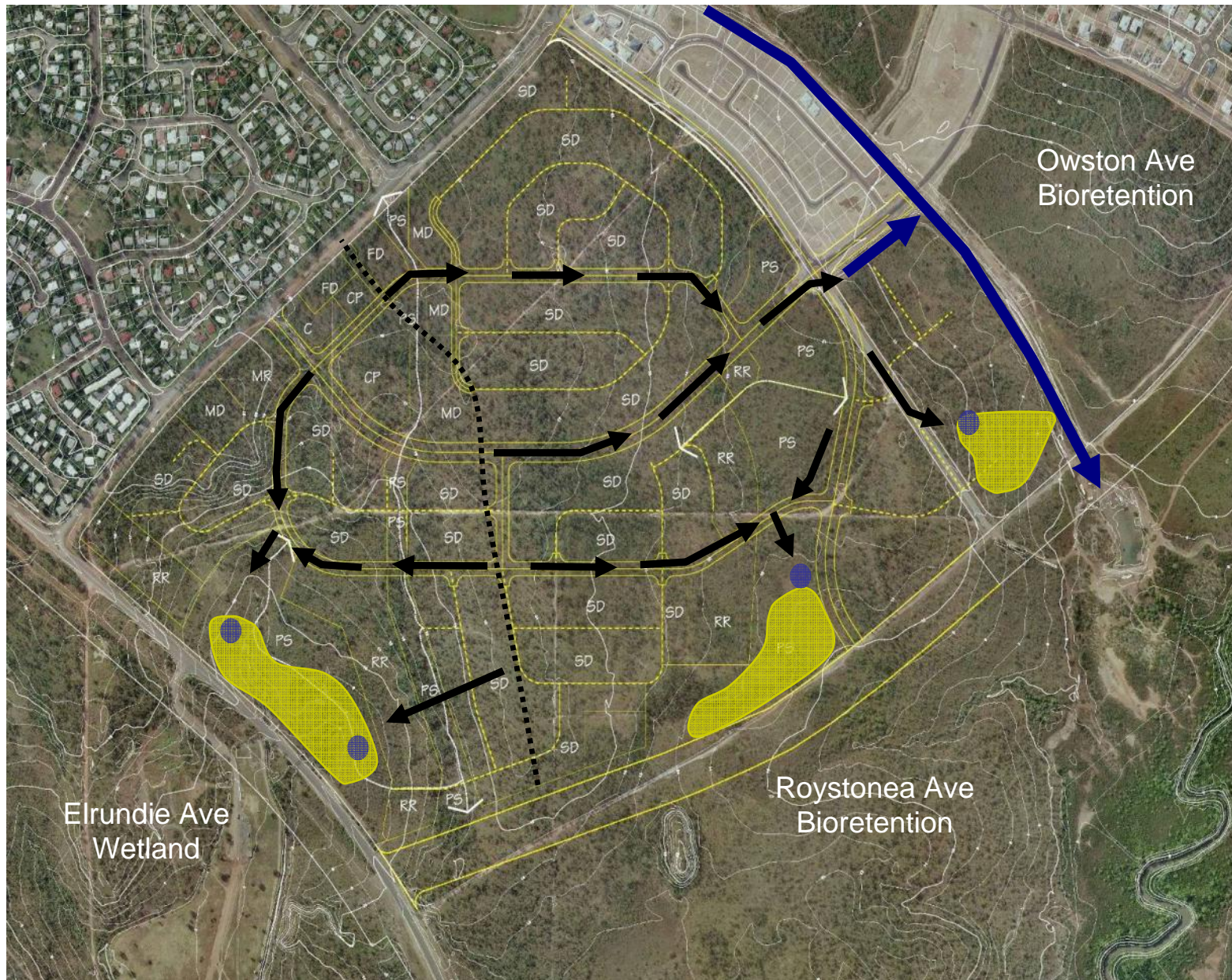
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WSUD Strategy for Bellamack - Objectives

- **Water quality**
 - 80% reduction in the mean annual load of total suspended solids
 - 60% reduction in the mean annual load of total phosphorus
 - 45% reduction in the mean annual load of total nitrogen
 - 90% reduction in the mean annual load of total gross pollutants
- **Water conservation**
 - Low water use public landscapes & private gardens
 - Water efficient fittings & appliances, including mandatory dual flush toilets
 - Utilise treated wastewater and groundwater for non-potable uses, particularly irrigation
- **Wastewater minimisation**
 - Demand management
 - Minimise wet weather infiltration
 - Maximise reuse
- **Landscape integration**



Stormwater treatment strategy



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WSUD strategy implementation

- Concept designs:
 - Workshopped with DPI, NRETAS, Health, Council
 - Sign off from PCG
- Detailed designs:
 - Being completed for the developer at Bellamack
- Construction
 - Subdivision developer
- Asset handover, ongoing maintenance
 - Council
- Monitoring strategy
 - NRETAS



Wetland design

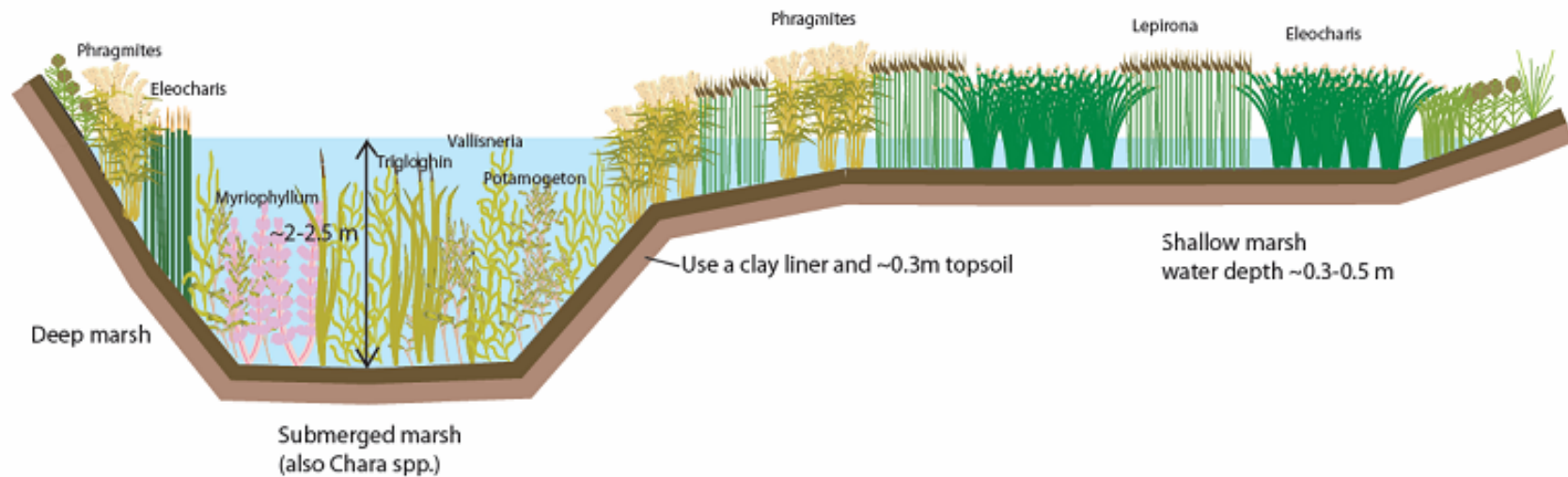
Bellamack wetlands: design development

- Key design issues
 - Water level fluctuations
 - Vegetation selection
 - Mosquito management
 - Integration into landscape/aesthetics
 - Cost
 - Maintenance

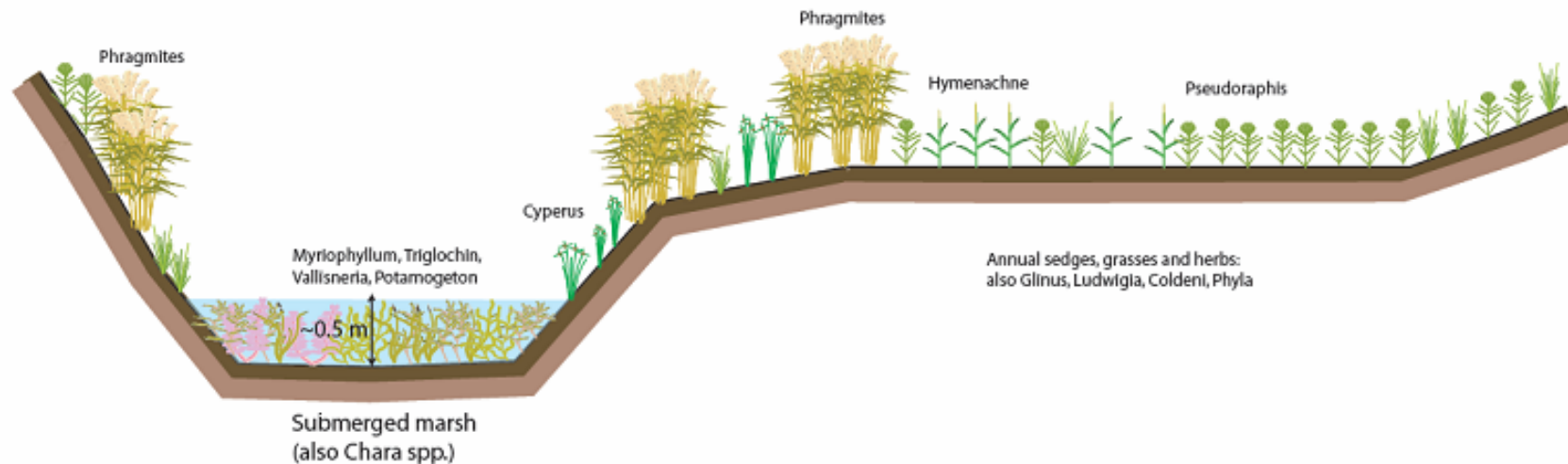




Conceptual solution



Wet season state



Dry season state



Our Harbour / Our Life / Our Future

DARWIN HARBOUR WATER SENSITIVE URBAN DESIGN STRATEGY

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Welcome to the Water Sensitive Urban Design Strategy for Darwin Harbour

Darwin Harbour is a unique natural resource, and provides significant community and environmental values. The Harbour is also the ultimate receiving environment for all stormwater and wastewater discharge from Darwin and Palmerston urban areas. Recent research has identified that although the harbour is considered to be in a near pristine condition with good water quality, the impacts of urban stormwater runoff and wastewater discharges are evident. As new development occurs in the region, there is potential for increasing impacts on the Harbour.

Water Sensitive Urban Design (WSUD) is a new approach to development, that takes an holistic approach to the planning and design of urban development that aims to minimise impacts on the natural water cycle and protect the health of aquatic ecosystems.

The **Water Sensitive Urban Design Strategy for Darwin Harbour** is a joint project between the Department of Planning and Infrastructure (DPI) and the Department of Natural Resources, Environment and the Arts (NRETA), supported by funding from the Commonwealth Coastal Catchments Initiative (CCI). It will provide policy, tools and resources to ensure that urban development in the Darwin region is underpinned by a commitment to sustainable urban water cycle and stormwater management.